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S. HRG. 101-366

NATIONAL INSTITUTES OF HEALTH AND BIOMEDICAL RESEARCH

HEARING

OF THE

COMMITTEE ON LABOR AND HUMAN RESOURCES UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

EXAMINING PROPOSED LEGISLATION TO PROVIDE FOR BIOMEDICAL RESEARCH OF THE NATIONAL INSTITUTES OF HEALTH

JULY 24, 1989

Printed for the use of the Committee on Labor and Human Resources

U.S. GOVERNMENT PRINTING OFFICE

20-546 WASHINGTON : 1989

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S541-7

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CONTENTS

STATEMENTS

MONDAY, JULY 24, 1989

	Page
Hatch, Hon. Orrin, G., prepared opening statement	2
Wyngaarden, Dr. James B., Director, National Institutes of Health, Bethesda, MD; Thomas McFee, Assistant Secretary for Personnel Administration, U.S. Department of Health and Human Services, Washington, DC, and Dr. Michael L. Millman, Division of Health Sciences Policy, Institute of Medicine, National Academy of Sciences, Washington, DC	9
Prepared statement of Dr. Millman	18
Challoner, Dr. David R., vice president for health affairs, University of Florida, Gainesville, FL; and Dr. Dennis Barnes, associate vice president for governmental relations, University of Virginia, Charlottesville, VA	31
Prepared statement of Dr. Barnes	37
Wilson, Dr. Linda S., president, Radcliffe College, on behalf of the Association of American Universities; Dr. Glenn A. Langer, associate dean for research, University of California, Los Angeles, CA, on behalf of the Association of American Medical Colleges; and Dr. David Satcher, president, Harry Medical College, Nashville, TN, on behalf of the Association of Minority Health Professions Schools	47
Prepared statements of:	
Dr. Wilson	50
Dr. Langer	59
Dr. Satcher	70

ADDITIONAL MATERIAL

Selected charts:	
National Institutes of Health—Cost/Year/Grant	4
Budget	5
Total number of extramural grants	6
Percent of grants longer than 4 years	7
Number of new extramural grants	8

NATIONAL INSTITUTES OF HEALTH AND BIOMEDICAL RESEARCH

MONDAY, JULY 24, 1989

U.S. SENATE,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 2:40 p.m., in room SD-430, Dirksen Senate Office Building, Senator Edward M. Kennedy (chairman of the committee), presiding.

Present: Senators Kennedy and Pell.

The CHAIRMAN. The committee will come to order.

Today's hearing on the National Institutes of Health will focus on maintaining the Nation's leading role in biomedical research.

Today I am introducing legislation that will address these problems and establish a new foundation. We will address the problem of facilities construction and of the retention of NIGH senior scientists; we will also address a new proposal to establish a private NIGH research foundation to support endowed chairs for senior researchers.

For years, NIGH has led the world in breakthrough discoveries of cures and treatments for a range of illnesses. Scientists at NIGH have made major contributions to the treatment of cancer, AIDS, heart disease and other priority areas for the Nation's health. They are now in the Early phases of the human gnome project, an undertaking in the medical field that will mean continued progress in our understanding of biology and the applications of biotechnology.

The country and the world are watching as new development after new development shapes our expectations and gives us hope for a better world. But we cannot rest on our laurels. Too many factors threaten our lead in biomedical science. In recent decades, our research facilities around the country have not received adequate support. Many of them around the country are now in need of renovation or expansion.

The Federal program to support extramural construction has been starved for funds since 1969, when Federal support of research facility construction began to diminish. Since that time, facilities have increasingly fallen into disrepair. It will be less expensive to assume our responsibilities now than to DeLay while construction costs continue to climb.

One way to address this problem is through a peer review matching program for facilities construction, and I intend to press this proposal.

The intramural program of NIGH is also being undermined by its inability to recruit and retain senior scientists. Inflexible personnel rules and rigid salary caps are a handicap to the Institutes. Salaries are not competitive with academia and the industrial world. In 11 years, not one scientist has been recruited to a senior position from outside the NIGH. Some top positions have been filled by promotion from within, but many important positions remain vacant. We will hear this afternoon about two ideas to address this problem—the Senior Biomedical Scientist Service and the NIGH Research Foundation.

We will now receive for the record a prepared statement of Senator Hatch.

[The prepared statement of Senator Hatch along with charts follows:]

PREPARED OPENING STATEMENT OF SENATOR HATCH

I want to thank the Chairman for holding this hearing today on the legislation that he and I are introducing. This legislation, the NIGH Biomedicine Research Act of 1989, will address a number of pressing problems confronting NIGH today. Most of these provisions were passed by this committee and the Senate during the last Congress but were dropped in conference at the insistence of the House.

The legislation being discussed today would give NIGH new authority to fund facilities construction. Our research facilities are aging and decaying. We need to rebuild and rejuvenate this important resource.

Next, this legislation would establish a senior scientist program at NIGH to help recruit and retain the scientists NIGH needs. My colleagues are aware that this is a problem which goes beyond NIGH and affects FDA, ADAMHA, and CRC as well. We need to pay our senior scientists salaries which are at least somewhat competitive with salaries in the private sector.

A third provision of this legislation is the establishment of a process that would let the Director of NIGH respond to emergencies or breakthroughs in our research efforts without having to return to Congress for a supplemental appropriation or having to sacrifice existing programs. I think the other members of this committee share my hope that with this new authority, we will not again be confronted with the last minute cancellation of a program which has just been funded.

Undoubtedly, other important provisions exist in this legislation, but I would like to spend a moment on NIGH itself. There are a number of misperceptions about the NIGH budget that need to be cleared up. First, there is the perception that the budget for NIGH has been cut during this decade. That could not be further from the truth. The NIGH budget with $3.3 billion in 1980 and is projected to be $7.5 billion in fiscal year 1990.

Some have speculated that NIGH is spending too much of this budget on intramural activities. In fact, 1980 NIGH spent more than half of its budget, $1.8 billion of its $3.4 billion, on things other than extra mural research. Today however, NIGH is spend-

ing well under half, or $3.2 billion of its projected $7.5 billion fiscal year 1990 budget, on intramural activities.

There is also the perception that the reason the number of new extramural grants for non-AIDS research has been falling is because new AIDS Grant were taking up all of the funding. Again, this is not true. While the number of AIDS-related extramural research grants has been steadily increasing during this decade, it still will represent only about 5 percent of the total new research grants funded during the next fiscal year.

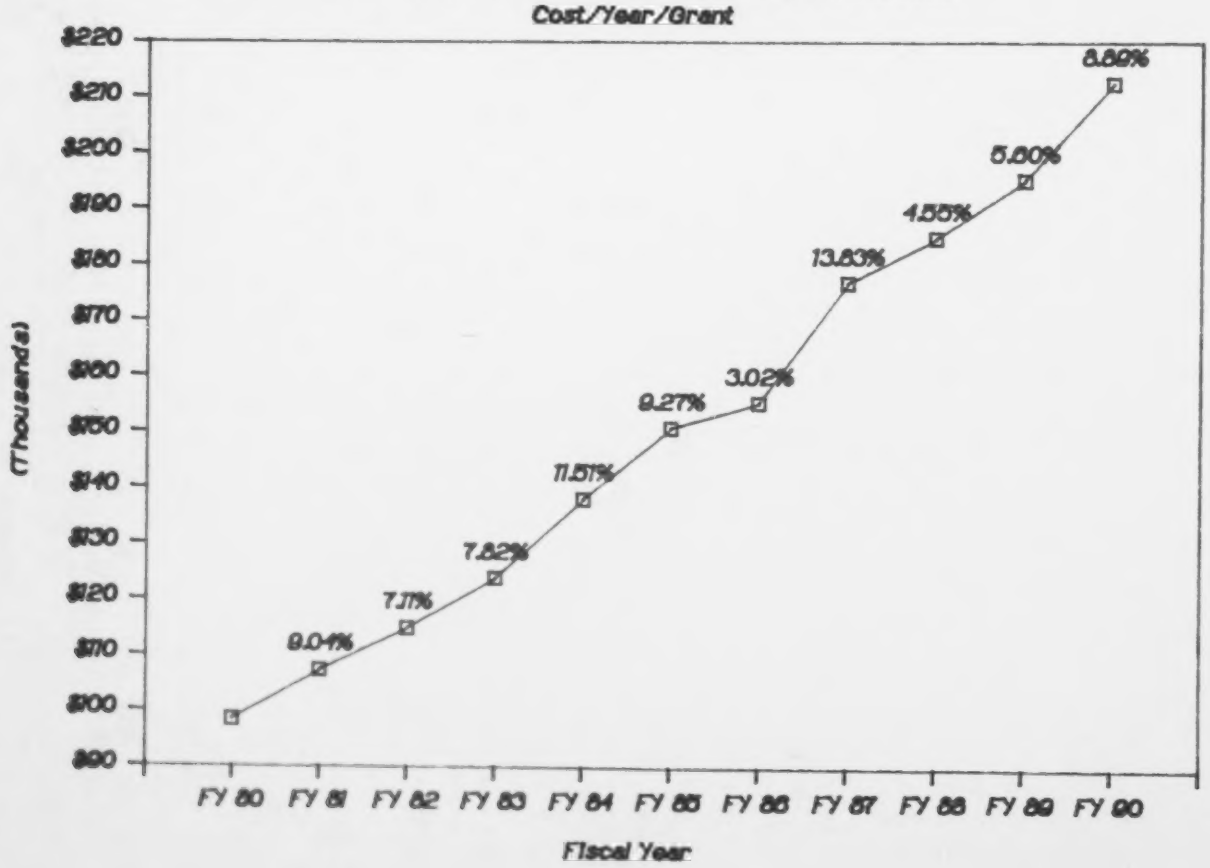
However, the number of new non-AIDS research Grant has been falling for the last 3 years. I was curious about why this was happening if NIGH was receiving steady and significant increases in its budgets, spending a lower and lower percentage of its budget on intramural research, and AIDS research was not the problem.

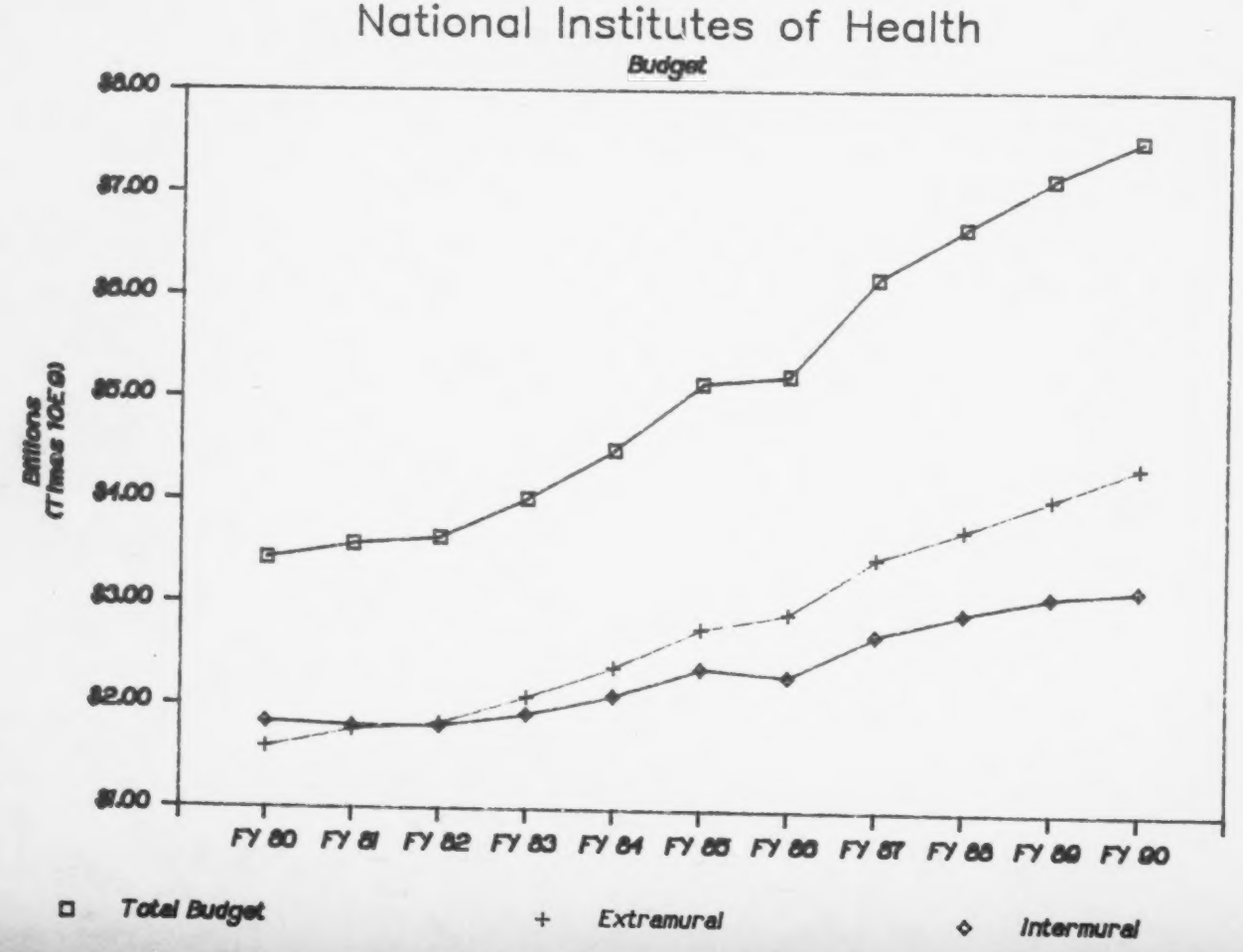
I believe the answer is really quite simple. During the latter part of this decade, NIGH has spent a higher percentage of its research budget on longer term research grants. From fiscal year 1980 to fiscal year 1984, more than 75 percent of the new extramural grants funded by NIGH were for 3 years or less. Less than 25 percent were for 4 years or more. By comparison, during the last 3 fiscal years, 46 percent in fiscal year 1987, 54 percent in fiscal year 1988, and 55 percent in fiscal year 1989 were for Grant of 4 years or more. NIGH is projecting that 54 percent will go for these longer term grants again in fiscal year 1990.

The reality is that the total number of extramural grants funded during this decade has increased dramatically; but, during the last few years, NIGH has decided to fund more long-term extra mural grants and fewer short-term grants. This decision has driven down the number of new grants each year since there is less turnover.

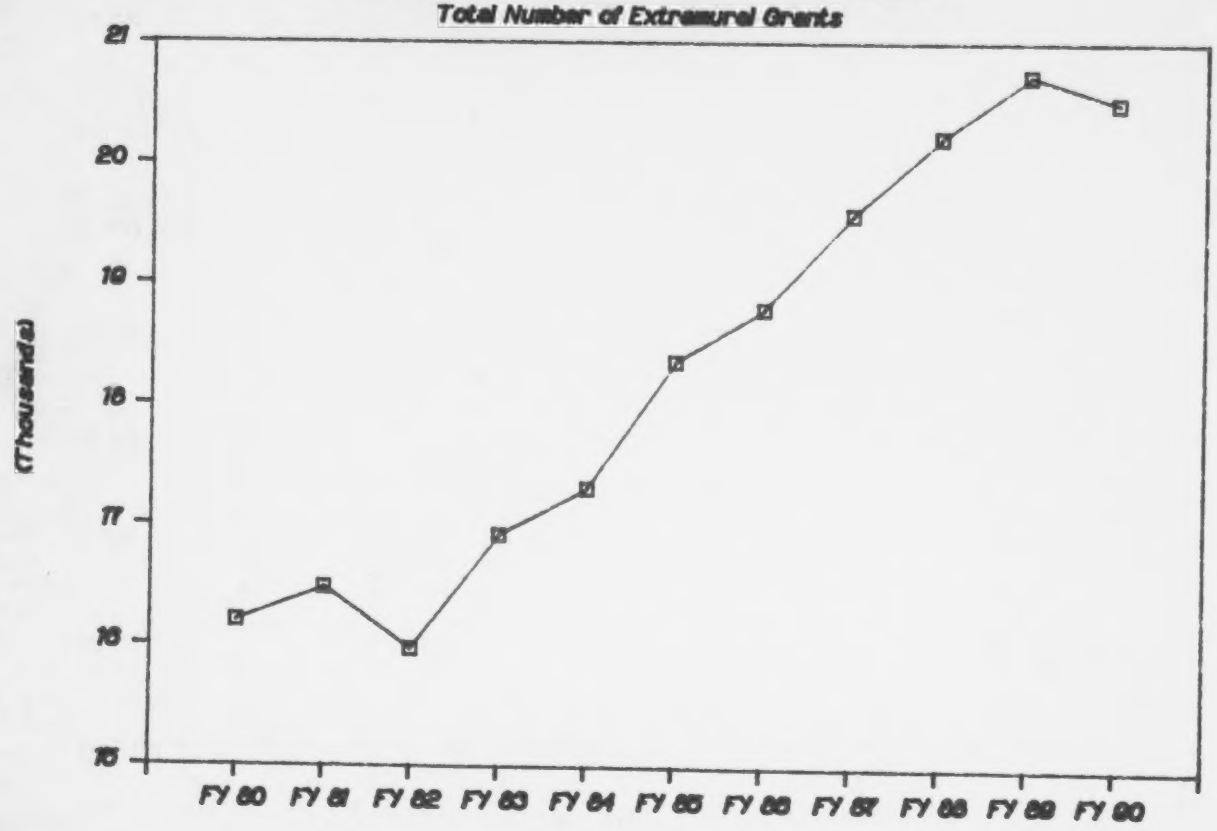
I hope that the former Director of NIGH, who is testifying before the committee today, will shed some light on the reasons NIGH has decided to fund fewer new grants each year. I look forward to reviewing the testimony presented today and working with my colleagues on the Labor Committee as we continue to make improvements in this, the world's premier research agency.

National Institutes of Health




National Institutes of Health
Budget
Billions
(1 Unit= 10E+09)
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
FY 80
FY 81
FY 82
FY 83
FY 84
FY 85
FY 86
FY 87
FY 88
FY 89
FY 90
Total Budget
Extramural
Intermural

National Institutes of Health



National Institutes of Health
% of grants longer than 4 years
56.00%
54.00%
52.00%
50.00%
48.00%
46.00%
44.00%
42.00%
40.00%
38.00%
36.00%
34.00%
32.00%
30.00%
28.00%
26.00%
24.00%
22.00%
20.00%
24.13%
24.62%
22.54%
21.63%
22.99%
26.83%
34.72%
40.20%
54.43%
54.64%
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FY 80
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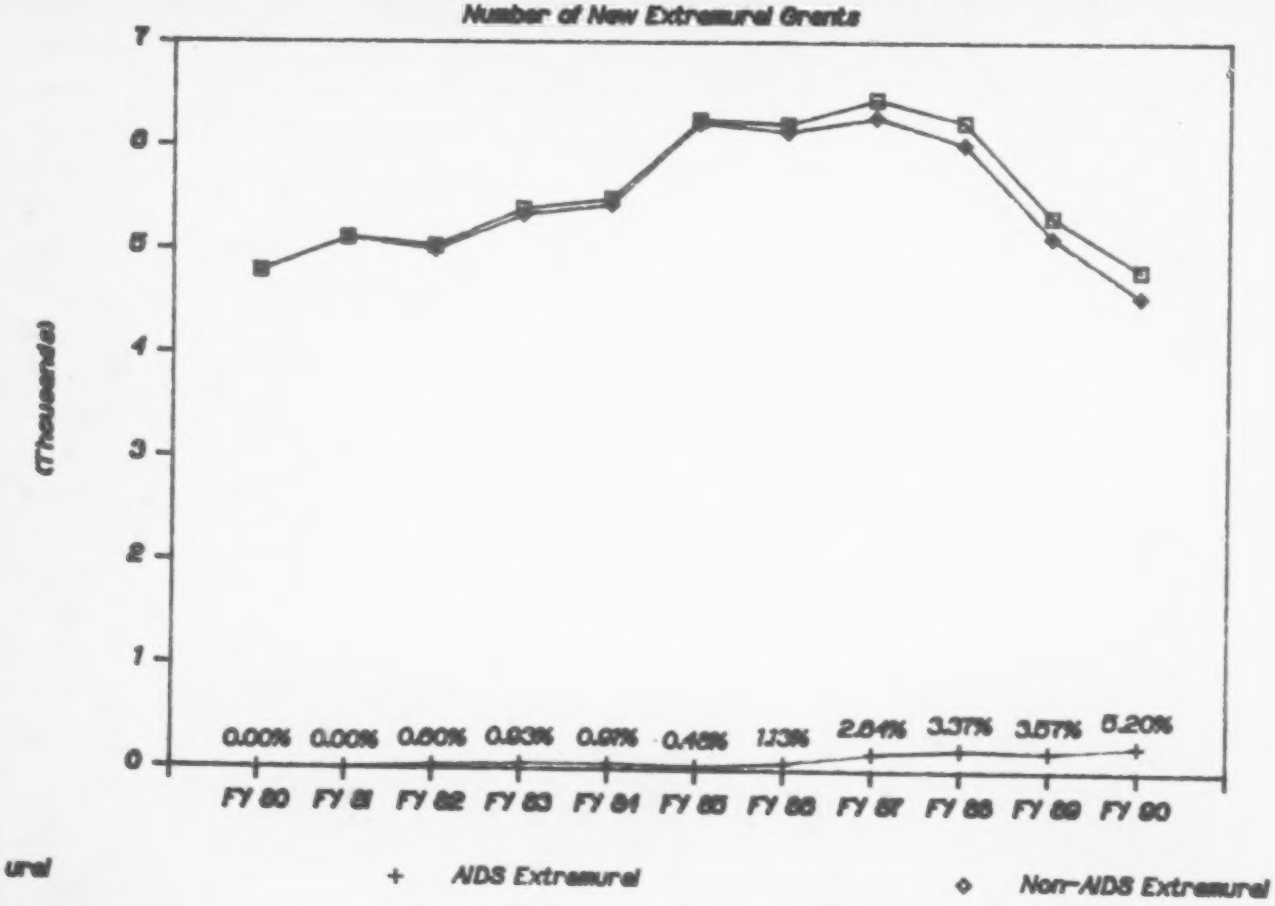
FY 89
FY 90

National Institutes of Health



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The CHAIRMAN. We are delighted to have a distinguished group of witnesses here this afternoon. We will hear from Mr. Tom McFee, the Chief Personnel Officer for the Department of Health and Human Services. Mr. McFee knows the personnel problems of the Public Health Service and its senior scientists in great detail.

We also have on our panel Dr. Wyngaarden, Director of the NIGH through the end of this month. He has provided fine leadership during a period of considerable innovation. He will give us a first-hand perspective on the recruitment and retention problems of the Institutes.

We also welcome Dr. Michael Milan, who is the Executive Director of the recent TOM report on the intramural program of the NIGH.

We welcome all of you. We want to take note that this committee had the good opportunity to hear from Dr. Wyngaarden when he first testified before the Congress a number of years ago, and he has given us the opportunity to hear from him on many different occasions since, both at these hearings and also on many of the different occasions on matters affecting not only the NIGH, but basic science research policy. We have valued that.

We take special note that this will be his final testimony before Congress, before he retires from a very successful and distinguished career as Director of the Institutes. We are delighted and honored to have him before our committee. We want him to know that even though this may be the last time that he will appear officially that we are going to take every opportunity to draw upon his vast knowledge, understanding, and experience for many years in the future.

Dr. Wyngaarden, we will start off with you—I know there are little protocol questions here, but we want to afford you the opportunity to lead off as our first witness here this afternoon.

STATEMENTS OF DR. JAMES B. WYNGAARDEN, DIRECTOR, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD; THOMAS MCFEE, ASSISTANT SECRETARY FOR PERSONNEL ADMINISTRATION, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, WASHINGTON, DC, AND DR. MICHAEL L. MILLMAN, DIVISION OF HEALTH SCIENCES POLICY, INSTITUTE OF MEDICINE, NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC

Dr. WYNGAARDEN. Thank you, Senator Kennedy, for those kind remarks. I was also going to recall that this completes a full cycle, having started before your committee for the confirmation and this appearance in what will likely be my last appearance as Director of the NIGH.

But I would like to thank you and the members of your committee for the very strong support you have given to the NIGH and to me personally during these past seven years; I have appreciated it very much.

I also appreciate this opportunity to address the committee and present my views on the problems the National Institutes of Health faces in recruiting and retaining senior scientists.

NIH has become the world's premier biomedical research institution because of the consistently superior quality of its senior staff,

who have made significant contributions to the major advances in the biomedical sciences and biotechnology over the last decade. Within the last two decades, many of these advances have opened potentially valuable and lucrative commercial applications and have caused a dramatic increase in the competition for top-caliber senior researchers and science managers in both the private and academic sectors. Federal compensation for these employees has not kept pace with the increasing competition. As a result, NIGH has been experiencing severe problems recruiting and retaining senior-level personnel of the prominence and stature required to lead and conduct national research programs into the causes and treatment of major human afflictions.

There are currently 176 highly-qualified and talented members of the Senior Executive Service at NIGH. Of these, 53 are physicians, and 104 have Ph.D. or other doctorate degrees. Nineteen hold other important senior-level positions, including resource and facility management. Virtually all of these individuals can command substantially higher salaries in the private or academic sectors, and many are considering employment offers. All have experienced severe salary limitations over the last several years.

Our studies show that on the average, NIGH Senior Executive Service physicians are paid about one-half as much as their academic counterparts. Other NIGH doctoral staff who belong to the Senior Executive Service are paid 19 percent less than comparable positions in research-intensive universities.

Furthermore, the gap in compensation between the NIGH and American medical schools is increasing. In 1982, our medical officers who were part of the DES were paid $39,000 less than their counterparts in American medical schools. Today, that gap has widened to $99,000. Many of our senior scientists are considering whether to remain with NIGH because of these salary considerations.

Our situation can best be illustrated by the results obtained from a survey NIGH recently conducted of employment offers that have been made to our permanent scientific staff within the last two years. Approximately one-quarter of our permanent doctoral-level scientists and science managers responded to this survey. Of the senior physicians who responded, 83 percent reported receiving one or more offers ranging from $100,000 to $500,000. The average employment offer was $166,000, approximately twice what they are making at NIGH.

Among senior nonphysician doctoral staff, 54 percent received employment offers of at least $10,000 more than their NIGH salary. The average offer was $105,000, which is 50 percent higher than they are now earning.

With offers of this magnitude, NIGH can expect to lose a substantial number of key senior research scientists and science managers.

The compensation gap has also made recruitment especially difficult. For example, since 1980, NIGH has not been able to recruit a single research scientist into the Senior Executive Service from the private or academic sectors to engage in the independent conduct of a clinical or basic biomedical research program.

In 1980, NIGH had 108 intramural research scientists in the DES. Since then, we have had 61 vacancies and have been able to fill only 30, all from within the Government. This is not an optimal situation.

To assure fresh leadership and innovation, we need to be able to hire scientists from outside the Government. In addition, there are numerous cases of top candidates who, after expressing substantial interest in senior positions at NIGH, withdrew from consideration because we could not offer an adequate salary or benefits. Among these, a large number of prominent candidates for five different Institute director positions declined further consideration because NIGH could not match their current salaries and benefits. During this same period of time, over 20 prestigious senior scientists expressed interest in positions for which NIGH was recruiting; all declined further consideration because they were currently earning salaries ranging from 20 to 263 percent more than NIGH could pay.

During the last year, NIGH has also attempted to recruit such senior staff as a pharmacologist to conduct AIDS-related drug analysis studies; a scientist to undertake research in nerve regeneration; a cancer radiation therapist; and several physicians in a variety of much-needed surgical specialties, including general cancer, and thoracic and neurosurgery.

NIH was not successful in filling any of these positions owing to inadequate compensation. As a result, a number of promising laboratory and clinical research initiatives have not been pursued, and several other existing programs have been curtailed. While this may not preclude research in these areas by other organizations, the cumulative loss undermines the overall strength of the NIGH.

It is not difficult to understand how these salary differentials within the private sector also affect our ability to retain senior staff. While many senior staff remain at NIGH because of its fundamental mission and its unparalleled reputation for scientific excellence, recruiters from academia and industry make highly-attractive offers to our senior staff that only too often are accepted.

In the last 10 years, NIGH has suffered a net loss of 28 percent of the 108 intramural research scientists who originally entered the Senior Executive Service. All left NIGH to accept positions in academic institutions, industry, and independent research laboratories at salary increases ranging from 50 to 300 percent. In the last 6 years, NIGH lost a deputy director and several institute directors due in part to salary considerations. Recently, a number of prominent scientists have left NIGH due in part to salary considerations. These losses include one of the country's foremost experts in breast cancer, and the individual responsible for managing a program which includes a national network of cooperative groups which conduct clinical research on new treatments for cancer.

A recent independent study of the NIGH intramural research programs conducted by the Institute of Medicine of the National Academy of Sciences confirms our findings. In this report, the Institute of Medicine states, "The reduction in the number of senior researchers, the increasing age of those remaining, the failure to successfully recruit from outside, and the evidence of generally noncompetitive salaries justifies NIGH concerns about their future

ability to recruit and retain senior researchers and research administrators. This is particularly serious since many of the current researchers are approaching retirement age."

One of the Institute's recommendations was that "Congress authorize NIGH to develop and implement a personnel demonstration project tailored to overcome the deficiencies of the current system." The Institute of Medicine suggested that the plan feature simplified hiring, classification, and pay administration, similar to the demonstration project now being conducted by the National Institute of Standards and Technology.

The TOM report also recommended an occupation-specific pay standard, based on surveys of market comparability; the ability to exceed Federal pay ceilings in justifiable circumstances; portability of retirement benefits between non-Federal employment and the NIGH; and a limit on personnel services costs in lieu of employment ceilings as a way of controlling personnel costs.

Equally important is the adverse effect an inadequate pay scale has had on our junior and mid-level scientists. NIGH is relatively successful in recruiting and developing bright and promising postdoctoral research scientists. Our employment trends indicate that as these scientists progress and begin to encounter salary compression due to pay limitations in the senior ranks, they leave the Government just as they are entering the peak of their careers.

For example, within the last year, salary considerations have led several prominent mid-level scientists to leave NIGH, including physicians specializing in oncology, pathology, neurology, dermatology and critical care medicine.

NIH encourages this to some degree because it fosters cross-fertilization of ideas between NIGH and the academic community and allows NIGH to bring in a new cadre of bright (AK) scientists with fresh ideas.

However, we expect that a continued limitation on the pay of senior-level staff will accelerate this trend. If this occurs, NIGH will have fewer available well-trained mid-level researchers to advance to senior leadership positions.

My views are also supported by the recent report of the National Commission on the Public Service. The Commission sounded an alarm that the noncompetitive salaries of the Senior Executive Service are undermining the Government's vital science programs. The report warned that the failure to increase these salaries will substantially diminish the ability to recruit and retain the highest-quality biomedical researchers, engineers, and other senior career executives who manage essential services in the Government.

The report suggests that the urgency of raises for career senior executives may be even more critical than salaries for elected and politically-appointed officials. The Commission recommended, "prompt action by the President and Congress to raise the cap on the Senior Executive Service, even if this means that their pay in some instances could exceed that being received by the political appointees above them."

NIH offers advantages that for many researchers have offset the salary differential. These include the intellectual stimulation and prestige of being a part of NIGH, scientific freedom to choose their own research pursuits, access to state-of-the-art equipment, free-

dom from administrative and teaching responsibilities, and opportunities for rewarding associations with outstanding scientists within many disciplines.

Some opportunities also exist for consulting, although they are subject to restrictions, and very few NIGH employees earn the maximum of $25,000 per year.

Even in the face of the widening salary gap, these advantages become less compelling.

Our recruitment and retention difficulties are occurring at a time of great challenge and opportunity in the biomedical sciences. If NIGH is to meet this challenge, it is vital that we have a core of top-caliber senior researchers and science managers who will provide the necessary innovation and leadership. To do so, NIGH must have the flexibility and capacity to compete nationwide for the best available scientific talent.

In the closing reports of its report, the Institute of Medicine stated, "that personnel problems, both those relating to compensation and the overall personnel system, are compromising the ability of NIGH to recruit and retain scientists of the highest quality."

I firmly believe that a resolution of these problems is essential to restoring NIGH to a fully competitive posture and demonstrating the commitment of the Federal Government to maintaining a first-class biomedical research program.

Mr. Chairman, I want to record my pleasure with President Bush's recent proposal, the Senior Executive Salary Act of 1989, which would provide higher salaries to employees in positions requiring specialized and critical skills and an 8 to 25 percent raise for Senior Executive Branch officials generally—and Mr. McFee will testify to that in just a moment.

Mr. Chairman, this concludes my prepared statement. I would be pleased to answer any questions that you or other members of the committee might have.

Thank you.

The CHAIRMAN. Thank you.

I think we'll hear from the whole panel before questioning.

Mr. McFee?

Mr. MCFEE. Mr. Chairman, I thank you for the invitation to be here today and to discuss the concerns I have about our ability to attract and retain quality personnel to perform our vital health research mission.

Over the past 12 years, I have served as the Assistant Secretary for Personnel Administration for the Department of Health and Human Services, one of the most largest, most complex of Federal agencies. In this post, I have observed the agony faced by our public health service agencies as they were rebuffed time and again in attempts to secure and keep talented and innovative research staff and their administrators.

Pay obviously has been a key negative force and has become even a stronger one, if that is possible. Dr. Wyngaarden has brought to your attention some specific examples of our inability to compete in the biomedical research marketplace. I am pleased that President Bush has submitted for Congressional action "The Senior Executive Salary Act of 1989". This is an excellent proposal to help stem the erosion of the pay of our senior Government officials. His

understanding of the dilemma faced at the upper echelons is quite evident; his plan to increase executive salaries and to require top-notch performance in return is most laudable.

I have to say for the record, however, that while pay is a very real problem, I believe that pay reform by itself is not a cure-all for our inability to garner top scientists.

For example, a simplified personnel system as the one used by the Navy at its China Lake and San Diego laboratories would greatly increase flexibility and help us at OHS.

I think that the advantages of this experimental system, which was developed under the Civil Service Reform Act's demonstration proposals, are the following: the pay-setting flexibilities that provide a built-in degree of market sensitivity to the recruiting process; the ability to more directly tie pay to performance, and reduced administrative burden on managers resulting from a greatly simplified job classification process. Managers, instead of being captive of the process, have truly become its controllers.

In addition, other proposals have been introduced which would move toward flexibility. An example is last year's Federal Personnel Improvement Act, Senate bill 2530, which among other things would have increased the number of allowable demonstration projects under the Civil Service Reform Act and provided other increased pay flexibilities like recruitment and retention bonuses and expanded authority to Grant advanced steps to new appointees.

Reflecting on my long years of Federal service, I have concluded that a single personnel system that applies to everyone, for example, the cookie-cutter approach, is just not effective anymore. Some 40 years ago, when Federal programs were fairly stable and the work force was more homogeneous, it may have been appropriate, but not now. It is time to take a hard look and take some bold steps in light to today's needs and realities.

For example, we have had a tremendous growth in the kinds and numbers of programs we administer and the increasing diversity of the people who administer them. Further, the current personnel system stresses administrative procedure at the expense of management flexibility.

The National Public Service Commission, or the Volcker Commission as it is known, set as one of its goals, which I fully support, a move to greater agency flexibility and autonomy in the human resource management area. But even that is not enough. I believe we need to take one step further and look seriously at making fundamental changes to the system itself—more how the process takes place, rather than where it takes place. And of course, these changes, even on an experimental basis, will require some legislative changes.

For all of its merits, though, I think we also need to look beyond just simplification—to building more flexibilities into the total compensation package that we offer—not just pay.

The need has already been identified in a 1986 survey conducted by the Merit Systems Protection Board, which found that 40 percent, not surprisingly, of OHS employees responded citing salary as the reason to consider leaving Government employment. Perhaps more surprisingly, though, 25 percent said they would consider leaving because of health benefits or the lack of them, and 20 per-

cent because of the retirement system and the inflexibilities that are built into that.

In fact, these exact reasons have been cited to us at OHS time and again as health research recruits turn down our offers, and key researchers on our rolls leave for better offers from outside Government.

Clearly, something must change, and that change must come soon if we are to continue to give the American public the best civil service possible. The pay proposal submitted by President Bush is an excellent one, that I look forward to implementing. I firmly believe, though, it is just a first step in the right direction, not the total solution.

Thank you.

The CHAIRMAN. Thank you.

Dr. Millman.

Dr. MILLMAN. Thank you, Senator Kennedy, for the opportunity to appear before the committee to address the issue of establishing a Foundation for Biomedical Research.

I am a senior staff officer at the Institute of Medicine, National Academy of Sciences. I served as the study director of a six-month project that resulted in a report entitled, "A Health NIGH Intramural Program: Structural Change or Administrative Remedies?" This study was funded by the Department of Health and Human Services at the request of the Office of Management and Budget. I am here today representing the study committee appointed by the Academy. Dr. Harold Shapiro, President of Princeton University, served as the committee chairman. A complete roster of this 14-member committee is appended to my written statement.

The impetus for the study was a concern that the intramural program of the National Institute of Health, for many years a distinguished component of the Nation's biomedical research effort, faces growing difficulties in attracting and retaining the strong cohort of basic biomedical scientists and clinical investigators, as was documented by Dr. Wyngaarden just now. This concern is often focused on the loss of senior investigators, but there are also questions raised at the more junior levels as well.

For one, there are fears that difficulties in recruiting the outstanding senior scientists, whose presence draws junior investigators to NIGH, may undermine the future vigor of the program.

To provide the basis for its deliberations, the committee reviewed the mission of the intramural program to determine whether it continues to play an appropriate role in the Nation's biomedical research effort, or whether a change of direction is needed. Having confirmed the continuing need for a strong Government laboratory focusing on biomedical research, the committee identified personnel and other administrative problems that may interfere with the accomplishment of the intramural program's mission. It then examined the wide range of possible solutions, including various forms of privatization.

The committee concluded that moving the intramural program out of Government and away from Federal constraints would be undesirable and impractical. None of the common forms of privatization would be as likely to sustain the vitality of the research effort as would more modest policy measures. Precedents for each

of the measures recommended by the committee can be found in other agencies of the Federal Government.

In a comparison of NIGH salary scales with similar positions in universities and industry, the committee found considerable and growing disparity, especially in the upper brackets. Therefore, the centerpiece of the TOM report is a recommendation that NIGH be permitted to undertake a personnel demonstration program to address the hiring and retention problems identified.

A major feature of this demonstration would be an occupation-specific pay standard based on surveys of market comparability. For several scientists, this would require NIGH to have the authority to exceed the Federal pay ceiling. Such a system is now in effect at the Uniformed Services University of the Health Sciences in the Department of Defense.

The committee recognized that this flexibility should be used with restraint because of political sensitivities, and to avoid morale problems that would be caused by the recruitment of career scientists at salary rates substantially in excess of those of current employees. However, NIGH needs on occasion to be able to recruit from the ranks of the most outstanding, established scientists, whose presence would inject new intellectual stimulation to the program. Scientists of this stature command salaries and resources beyond the level that the demonstration program would allow.

The committee believes that creating a small number of time-limited, exceptional appointments would avoid political and morale problems. Creating endowed chairs outside the Federal civil service system would enable NIGH to provide competitive salaries substantially higher than the Federal civil service ceiling and to provide other resources such as equipment, travel expenses and technical support staff. To accomplish this, the committee recommended that Congress charter a foundation to permit the private support of up to ten endowed chairs for distinguished investigators.

The creation of a foundation similar to those established for the Uniformed University of the Health Sciences and the National Park Service would permit funds to be raised from the private sector. However, the committee emphasized that the foundation's receipt of private funds must be modest, so as not to be viewed as serious competition with other biomedical research endeavors. For this reason, the committee suggested that Congress consider a fund-matching or other cost-sharing provision. Furthermore, this would show that the Federal Government is not abrogating responsibility for staffing one of its own laboratories.

Since the primary purpose of the foundation is to bring the recruited scientists into the heart of the intramural program, it is important to ensure that administrative processes do not inhibit this. Therefore, NIGH and the foundation should work closely together to develop formal agreements to ensure that the foundation operates efficiently and effectively in meeting intramural program needs. In addition, appropriate mechanisms must be put in place to prevent any appearance of conflict of interest on the part of those contributing to the endowment of such chairs.

Also incorporated into the proposed Foundation of Biomedical Research is a second recommendation from the TOM report—an NIGH Scholars Program. The bill assigns responsibility for sup-

porting the stipends and research expenses of these scholars as well as those holding endowed chairs.

In the past, most (AK) scientists have entered NIGH as postdoctoral fellows immediately after completing their M.D. or Phd.D. programs. They usually lack postdoctoral research training, which they then receive at NIGH under the guidance of a senior scientist. If they perform well, they are asked to remain in the institute, where they gradually advance up the scientific and administrative ladder. They usually remain for a number of years under the immediate direction of a senior scientist.

This system has the advantage of providing a constant supply of junior workers who assist in the projects of senior scientists. In many instances, these postdoctoral fellows receive outstanding training. When they finally achieve independence, many of them become highly-productive scientists and makeup the core of NIGH.

Although this system has worked well in the past, it does not assure a steady flow of new ideas. Postdoctoral fellows who train at NIGH under a particular laboratory chief tend to reflect the scientific slant of that preceptor. At universities, this problem is solved by the continual recruitment of new assistant professors who were trained in other institutions. These (AK) scientists bring new approaches and methodologies that they have learned during their postdoctoral fellowships.

For NIGH, this problem could be solved by the creation of a Scholars Program to recruit the brightest (AK) investigators at the most creative stages of their careers. It could be modeled on existing programs at the White Head Institute of the Massachusetts Institute of Technology and on the Rockefeller Scholars Program.

Aside from providing a continuing source of highly-qualified (AK) researchers, the program would open opportunities for the scientific directors of each institute to oversee the development of new initiatives outside of the existing laboratory expertise.

It is in the best interest of both NIGH and the overall biomedical research community that NIGH have a process designed to ensure that it systematically recruits its share of the best (AK) investigators possible.

The program as described in the TOM report is a 6-year term, and up to six scholars per year.

In conclusion, despite growing difficulties in staffing, the intramural research program continues to make invaluable contributions to our knowledge and understanding of basic biological processes and their dysfunction in disease. However, some changes are absolutely necessary if the intramural program is to continue to make the important contributions as the distinctive and valuable component of the Nation's biomedical research enterprise that the committee found it to be.

The CHAIRMAN. Thank you very much.

[The prepared statement of Dr. Millman follows:]

PREPARED STATEMENT OF DR. MICHAEL L. MILLMAN

Thank you for the opportunity to appear before the committee to address the issue of establishing a Foundation for Biomedical Research. I am Michael Millman, a senior staff officer of the Institute of Medicine, National Academy of Sciences. I served as the study director of a 6-month project that resulted in a report entitled A Healthy NIH Intramural Program: Structural Change or Administrative Remedies? This study was funded by the Department of Health and Human Services at the request of the Office of Management and Budget. I am here today representing the study committee appointed by the Academy. Dr. Harold Shapiro, President of Princeton University, served as the committee chairman. A complete roster of this 14-member committee is appended to my written statement.

The impetus for the study was a concern that the intramural program of the National Institutes of Health (NIH), for many years a distinguished component of the nation's biomedical research effort, faces growing difficulties in attracting and retaining the strong cohort of basic biomedical scientists and clinical investigators needed to ensure continued excellence in research. This concern is often focused on the loss of senior investigators, but similar questions are raised about scientists

at more junior levels. There are fears that difficulties in recruiting the outstanding senior scientists whose presence draw junior investigators to NIH may undermine the future vigor of the program.

To provide the basis for its deliberations, the committee reviewed the mission of the intramural program to determine whether it continues to play an appropriate role in the nation's biomedical research effort, or whether a change of direction is needed. Having confirmed the continuing need for a strong government laboratory focusing on biomedical research, the committee identified personnel and other administrative problems that may interfere with the accomplishment of the intramural program's mission. It then examined a wide range of possible solutions including various forms of privatization.

The committee concluded that moving the intramural program out of government and away from federal constraints would be undesirable and impractical. None of the common forms of privatization would be as likely to sustain the vitality of the research effort as would more modest policy measures. Precedents for each of the measures recommended by the committee can be found in other agencies of the federal government.

In a comparison of NIH salary scales with similar positions in universities and industry, the committee found considerable and growing disparity, especially in the upper brackets. Therefore, the centerpiece of the IOM report is a recommendation that NIH be permitted to undertake a personnel demonstration program to address the hiring and retention problems identified. A major feature of this demonstration would be an occupation-specific pay standard based on surveys of market comparability. For several scientists this would require NIH to have the authority to exceed the federal pay ceiling. Such a system is now in effect at the Uniformed Services University of the Health Sciences in the Department of Defense.

The committee recognized that this flexibility should be used with restraint, because of political sensitivities, and to avoid morale problems that would be caused by the recruitment of career scientists at salary rates substantially in excess of those of current employees. However, NIH needs on occasion to be able to recruit from the ranks of the most outstanding, established scientists, whose presence would inject new intellectual stimulation to the program. Scientists of this stature command salaries and resources beyond the level that the demonstration program would allow. The committee believes that creating a small number of time-limited, exceptional appointments would avoid political and morale problems. Creating endowed

chairs outside the federal civil service system would enable NIH to provide competitive salaries substantially higher than the federal civil service ceiling, and to provide other resources such as equipment, travel expenses, and technical support staff. To accomplish this, the committee recommended that Congress charter a foundation to permit the private support of up to ten endowed chairs for distinguished investigators.

The creation of a foundation similar to those established for the Uniformed University of the Health Sciences and the National Park Service, would permit funds to be raised from the private sector. However, the committee emphasized that the foundation's receipt of private funds be modest, so as not to be viewed as serious competition with other biomedical research endeavors. For this reason, the committee suggested that Congress consider a fund-matching, or other cost-sharing, provision. Furthermore, this would show that the federal government is not abrogating responsibility for staffing one of its own laboratories.

Since the primary purpose of the foundation is to bring the recruited scientists into the heart of the intramural program, it is important to ensure that administrative processes do not inhibit this. Therefore, NIH and the foundation should work closely together to develop formal agreements to ensure that the

Foundation operates efficiently and effectively in meeting the intramural program's needs. In addition, appropriate mechanisms must be put in place to prevent any appearance of conflict of interest on the part of those contributing to the endowment of such chairs.

Also incorporated into the proposed Foundation of Biomedical Research is a second recommendation from the IOM report -- an NIH Scholars Program. The bill assigns responsibility for supporting the stipends and research expenses of these scholars as well as those holding endowed chairs.

In the past, most young scientists have entered NIH as postdoctoral fellows immediately after completing their M.D. or Ph.D. programs. They usually lack postdoctoral research training, which they then receive at NIH under the guidance of a senior scientist. If they perform well, they are asked to remain in the institute, where they gradually advance up the scientific and administrative ladder. They usually remain for a number of years under the immediate direction of a senior scientist.

This system has the advantage of providing a constant supply of junior workers who assist in the projects of senior scientists. In many instances, these postdoctoral fellows receive outstanding training. When they finally achieve

independence, many of them become highly productive scientists and make up the core of NIH. Although the system has worked well in the past, it does not assure a steady flow of new ideas. Postdoctoral fellows who train at NIH under a particular laboratory chief tend to reflect the scientific slant of that preceptor. At universities this problem is solved by the continual recruitment of new assistant professors who were trained in other institutions. These young scientists bring new approaches and methodologies that they have learned during their postdoctoral fellowships.

For NIH, this problem could be solved by the creation of a Scholars Program to recruit the brightest young investigators at the most creative stages of their careers. It could be modeled on existing programs at the Whitehead Institute of the Massachusetts Institute of Technology and on the Rockefeller Scholars Program. Aside from providing a continuing source of highly-qualified young researchers, the program would open opportunities for the scientific directors of each institute to oversee the development of new initiatives outside of the existing laboratory expertise. It is in the best interest of both NIH and the overall biomedical research community that NIH have a process designed to ensure that it systematically recruits its share of the best young investigators available.

The program would have several features to make it as attractive to young investigators as other prestigious appointments now available in academic institutions. To achieve this, prospective scholars must perceive that the institutes are competing to employ the best talent that universities have to offer, that resources are available to make this experience highly productive, and becoming an NIH scholar is seen as a major step toward an outstanding career. Up to six scholars per year should be offered appointments for six years as independent basic or clinical researchers.

It is anticipated that some of these scientists would remain at NIH following the 6-year term, thereby increasing the pool from which NIH leadership is selected. It is also expected that some of these scholars will take positions of leadership outside the NIH--furthering NIH's traditional role of seeding the extramural research community.

In conclusion, despite growing difficulties in staffing, the intramural research program continues to make invaluable contributions to our knowledge and understanding of basic biological processes and their dysfunction in disease. However, some changes are absolutely necessary if the intramural program is to continue to make the important contributions as the distinctive and valuable component of the nation's biomedical research enterprise that the committee found it to be.

INSTITUTE OF MEDICINE

COMMITTEE TO STUDY STRATEGIES TO STRENGTHEN THE SCIENTIFIC EXCELLENCE OF THE NATIONAL INSTITUTES OF HEALTH INTRAMURAL RESEARCH PROGRAM

HAROLD T. SHAPIRO, (Chairman), President, Princeton University, Princeton, New Jersey.

MICHAEL S. BROWN,* Professor of Genetics, University of Texas Health Science Center, Dallas, Texas.

JOHN T. DUNLOP,* Lamont University Professor, Emeritus, Harvard University, Cambridge, Massachusetts.

GERALD D. FISCHBACH, Chairman of Anatomy and Neurobiology, Washington University, St. Louis, Missouri.

MARIAN E. KOSHLAND, Professor and Chair, Department of Microbiology and Immunology, University of California, Berkeley, California.

CHARLOTTE V. KUH, Executive Director, Educational Testing Service, Princeton, New Jersey.

ROBERT I. LEVY,* President and Chief Executive Officer, Sandoz Research Institute, East Hanover, New Jersey.

WALTER E. MASSEY, Vice President for Research and for Argonne National Laboratory, The University of Chicago, Chicago, Illinois.

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LLOYD H. SMITH,* Associate Dean and Professor of Medicine, University of California at San Francisco, San Francisco, California.

ELMER B. STAATS, Former U.S. Comptroller General, Washington, D.C.

P. ROY VAGELOS,* Chairman and Chief Executive Officer, Merck and Company, Rahway, New Jersey.

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*Member, Institute of Medicine

The CHAIRMAN. Dr. Wyngaarden, I wonder if you might be able to supply for the record what the differential has been in the past 20 years between the NIGH and the various civilian or scientific or industrial sectors; I don't know whether that is available, but I think you would find that the disparity today is greater than it has ever been.

Dr. WYNGAARDEN. We can certainly do that. We have good data for the academic sector, and we would have to do a little bit of checking for the industrial sector. But I mentioned two figures—the gap between the senior scientific service average salary for M.D. scientists in 1982 and that of clinical department/chairmen of medical schools was then 39 percent; it is now 99 percent. We can go back

The CHAIRMAN. Well, I think we are all aware of those flow lines. If you could look through the collected material do not think it would require a lot of additional research—and put it together in a way that the flow line has been, I think that would be helpful to us.

Dr. WYNGAARDEN. Yes, we will do that.

The CHAIRMAN. Can you outline for us some of the areas of research which are not moving forward as rapidly as you believe that they should. I think you mentioned some of the areas which have department heads that you have not been able to replace. But are there important areas of research that you as a scientist and researcher feel are not moving forward as rapidly as they should?

Dr. WYNGAARDEN. Yes. In addition to those that I mentioned in my prepared testimony, I could cite some others. The expansion of our radiation therapy treatment program has been handicapped. We have been unable to hire a senior-level radio chemist, and that precludes a full-scale labelling and investigation of chelated chemistry and radioisotope-tagged monoclonal antibodies. We have been unable to hire a senior radiation oncologist therapist, and that has prevented ongoing radiation therapy trials from progressing. We have been unable to attract a senior-level pharmacologist and suitable staff to allow studies of AIDS-related drugs, and therefore that program is not going forward.

In the surgery branch in the Cancer Institute, we have been unable to attract senior surgical personnel, for example, plastic surgery, which limits protocols on rehabilitative surgery. We have had difficulty attracting a thoracic surgeon, and that has limited protocols in that area. We have had difficulty attracting general surgeons, and that has limited general surgical services—even such relatively simple things as intravenous catheter line insertions, which is sometimes a problem.

We have been working with the diagnostic radiology community in hopes of establishing a more effective program in diagnostic radiology or imaging research. I think we would be unlikely to be successful there at the given salary rates, because of the existing salaries in that field.

And we have for many years advertised positions in otolaryngology and were never able to fill those and finally did that via contract mechanism, so that is a purely clinical service now, with no research as part of that.

Those are just a few examples. Most of these are clearly in the surgical and medical sub specialty areas where the salaries in the private sector are so much greater than ours.

The CHAIRMAN. There were comments made about the impact of unfilled senior positions on the ability to recruit able, gifted, imaginative and talented younger people. What is really going to be the impact; can we assess what the impact will be on the NIGH if this continues—if we don't come to grips with this in a serious way?

Dr. WYNGAARDEN. Well, it is a judgment call, and it certainly is my judgment and that of many others who have looked at our situation, including the TOM panel, that although things are not—I would not say they are "desperate" at the moment; that would be too strong—but we are in a situation of negative balance. We are losing talented senior people. We are losing, I think, too many of our mid-career people who are just approaching their prime. And although we have a strong bench, which has saved us, I don't think we have sufficient depth to cover these losses indefinitely, and as a consequence we would anticipate that, absent some corrective measures, both salary and flexibility, as has been mentioned, that the NIGH will have difficulty maintaining its quality over time.

The CHAIRMAN. Finally, on the discretionary fund, how helpful is that to you and how important is it to the agency itself in dealing with new challenges?

Dr. WYNGAARDEN. I think it would be very helpful to have some discretionary funds. At present, the Director's office has none, and there are a number of things that we might have done had we had such funds in the past. The most recent one would have been to supply some of those discretionary funds to correct the situation in our training portfolio. As you know, we found it necessary to increase stipends. We did that after the hearings last year, and only by the good graces of the Congress with respect to reprogramming requests have we been able to repair that so that the number of trainees supported this year will be very close to that of last year. Had we had a discretionary fund, we could have done that without any damage to other programs because we had to draw from research programs and some others, intramural programs, in order to cover that deficit.

In addition, every year certain of our institutes find themselves strapped for funds to support research project grants. It is not easily predictable institute-by-institute, and each year some institute—likely some different one from one year to the next—is at a very low award rate, maybe below 20 percent of their approved projects would be funded. If the director had some discretionary funds, he or she could even up that imbalance.

Those are just a couple of examples of what we might do.

The CHAIRMAN. Mr. McFee, given the Administration's pay raise plan, would it effect enough scientists to significantly reduce the problems of the Public Health Service?

Mr. MCFEE. Let me start in answering that question to describe what our needs are in order to, at least in our current estimation, make a major impact on the recruitment and retention problem.

For the last 2 years or so, we have been working very hard within the Department, both in the personnel offices and in the Public Health Service scientific areas, to come up with what would

be best for us as a personnel system that would have all of the characteristics that we think we need. As I mentioned in my testimony, it goes far beyond just increased pay.

We entitled this "The Senior Biomedical Research Service", and we have been, as I said, working on this for some time.

It would be a separate pay system entirely from the competitive civil service system under Title V. It would be a very flexible system that allowed us to meet our recruitment needs and our retention needs. It would cover the top biomedical research scientists in the Public Health Service. To give you a feel for the numbers of people who would be covered by such a service, it would cover commissioned officers that are now at the Assistant Surgeon General level and top level, 06, in the commissioned corps. It would cover people who are now in DES and its subset, known as the Senior Scientific Service, which is a part of DES, and some GUS-15's, both M.D.'s and Ph.D.'s. It would be a very exclusive corps, and although we have some 1,450 individuals now in the Public Health Service that fall in these categories—and in addition I should have mentioned that all of them will be doctoral level in their background, experience and training—and through a very selective process, we estimate that about 713, to be exact, people would be invited to join the corps.

This would be a voluntary scientific service where people would give up their civil service status in return for better benefits in the system.

The pay for the service that we have been thinking about would be a three-tiered pay system. First there would be a base pay, and that would be set somewhere between the first step of the GUS-15 in the present system and the counterpart to Executive Level 4 in the Executive Service. Presently that is somewhere between $57,000 and $80,000 being the Executive Level 4 salary at the present time. This salary would be based upon the past experience and the level of expertise that they would have.

But in addition to this, the Department could pay two supplemental pays—one for scientific accomplishments and achievements, and one for administrative responsibilities. These would be separately determined and would be added to the base pay.

The total pay that any individual in this system could get would not be fixed at a level or a limit as most of the caps in the Federal pay system are now, at some one of the Executive Level caps like Level 1, the Cabinet Secretary, or Level 5, the regular civil service pay cap is set, but would be indexed to an index of the pay that is being given to chairmen of clinical service departments in the American medical schools. That index is well available, published by the AAMC, and we could use a certain portion of that index as our cap in our proposal. That cap right now, this year, is at $193,000. You have got to realize that this is the mean salary of clinical chairman of clinical departments. We would propose that there be a general cap of 80 percent of that, or $135,000, and that the base pay and the two supplemental pays could not exceed $135,000.

We would also have in our proposal for 20 percent of those people that could go to 80 percent of that cap, which is $154,000. Now, I gave you those specific numbers so that you could get a feel

for the magnitude of the gap that we are experiencing in this particular area.

Now back to the President's pay proposal. As you know, this proposal would raise the Executive Level pays and raise the Senior Executive Service pays by a range from 8 to 25 percent. That top cap that we were talking about, Executive Level 4, would go to a little over $100,000, and the overall cap that an Deer could get in the President's pay proposal would be the Level 1 cap, which would go up to $125,000 in the President's pay proposal.

So the bottom line of this is that for the regular Deer, they could be paid under the President's proposal, if it were to pass in its entirety, up to $125,000, which would start us on the way to being able to achieve some of the pay recognition that we are working for.

It is slightly more complicated in that area by a proposal which the President has also proposed that up to 200 of these scientists could exceed that level, or could go up to the Level 1 cap in a combination of base pays, et cetera.

Now let me back up and correct something. I said under the President's proposal, the regular civil servant could go up to $125,000. The base pay could not go beyond $80,000, but there are other pay provisions which are in place which would continue under the President's proposal. One is a $20,000 physician's comparability bonus that could be paid on top of that base pay. There are also rank awards and bonuses for performance that could be paid. But the limit would be the $125,000.

The present proposal has in it a provision that only 200 people altogether could go above that $125,000 cap, and the allocation of that is a little up in the air at the present time, and for purposes of giving you a feel as to what the proposal would do for us, we just figured that we may be able to get 50 of those out of the 200 for the whole Government. That may be too large a number; it may be too small. And given the fact that we might be able to get 50 of these, we've worked out some alternatives as to how many of the people out of this 713 would be able to be covered at various levels of the President's proposal—and let me start from the least coverage to the——

The CHAIRMAN. Yes, if you could do it very quickly, and then we can receive the remainder for the record, because we have a couple of more panels here. Let me understand—what is that first proposal? I mean, it seems the NIGH could use up to 200 alone.

Mr. MCFEE. That is the President's proposal, Senator.

The CHAIRMAN. The first one that you outlined, that first description.

Mr. MCFEE. That is one that we have been working on internally within the Department.

The CHAIRMAN. Yes, I am just trying to get what is the President's—the first one, you have been working internally, and at least to your best judgment it would be the kind of proposal that would be necessary to deal with the problem as you see it; is that right?

Mr. MCFEE. That is correct.

The CHAIRMAN. OK. And anything that is short of that is less than dealing with the problem; is that correct?

Mr. MCFEE. That is right.

The CHAIRMAN. I won't ask you the third question, which you can probably imagine, but I think we've probably got enough on the record.

I don't want to cut you off, but I am going to have to recess at 4:30, and we do have two other panels. So if we could, we will file the remainder of your response. If you want to make a quick summary comment on it

Mr. MCFEE. I will for the record.

The CHAIRMAN. OK, great.

Mr. MCFEE. The bottom line is that the President's proposal would, depending upon some other flexibilities that we could use, could possibly get us up to about 60 percent of the people getting adequate pay. It would still leave about 40 percent of those scientists with inadequate pay.

The CHAIRMAN. Well, I am quite prepared to say it is inadequate; I won't ask you to say that.

Let me ask you this, Dr. Milan. Can you comment on how you feel the foundation, which is going to be accepting money from private industries, can avoid the appearance of conflict of interest?

Dr. MILLMAN. The committee clearly saw there were some potential pitfalls and was concerned that the foundation protect itself from the reality and appearance of conflict. Since there are already models in the Federal Government, clearly it can be done. What is needed is a careful review of how those foundations protect themselves. It may mean pooling of funds, it may mean limiting the contribution from one donor as a proportion of a particular chair. The committee's exhortation was to be careful because it saw this as a point of vulnerability. They did not feel it appropriate to prescribe the set of rules.

In my opinion, this is an issue that needs to be dealt with in the charter of the organization as opposed to detailing it in the legislation.

The CHAIRMAN. Thank you very much.

Senator Pell?

Senator PELL. Thank you very much.

I just want to join Senator Kennedy in wishing Dr. Wyngaarden well; he has done a wonderful job for the last seven years.

One query, perhaps a little outside the scope of this hearing, but how is the International Cancer Research Data Bank coming along?

Dr. WYNGAARDEN. Well, Senator, I want to thank you for your kind comments. I think we are making progress on the International Data Bank. Of course, the data that is entered into the Library of Medicine is available to foreign inquirers through the usual channels, so that fortunately that information is available worldwide to those who are in a position to make use of it.

Senator PELL. Thank you very much.

The CHAIRMAN. Thank you all very much, and if there are additional questions to be submitted, we will inquire of you further in writing. But I want to thank you all very much.

The CHAIRMAN. Our next panel includes Dr. Challoner, Vice President for Health Affairs, University of Florida College of Medi-

cine at Gainesville, and Dr. Barnes is the Associate Provost for Research at the University of Virginia.

Dr. Challoner, we'll ask you if you will be good enough to start off.

STATEMENTS OF DR. DAVID R. CHALLONER, VICE PRESIDENT FOR HEALTH AFFAIRS, UNIVERSITY OF FLORIDA, GAINESVILLE, FL; AND DR. DENNIS BARNES, ASSOCIATE VICE PRESIDENT FOR GOVERNMENTAL RELATIONS, UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE, VA

Dr. CHALLONER. Thank you, Senator.

Good morning, I am Dr. David R. Challoner, vice president for health affairs at the University of Florida College of Medicine in Gainesville.

My initial reaction to the request to review for this committee the history of Federal involvement in the construction of health research facilities for our Nation was unadulterated enthusiasm. But as I began to put pen to paper, I was quickly forced to face the reality that the major authority for the program, Public Law 84-835, the Health Research Facilities Act of 1956, had become law just about the time I graduated from college, and the last appropriation made under it coincided with my very earliest years in research. The mood that permeated the research community while the law was in place is indelibly etched in my memory. However, hardly a man is still alive who was an active investigator not only during this period, but also long enough before it to appreciate what a difference it made. Therefore, I have had to consult with my elders and with the public record to flesh out with specific facts my vivid impressions of the then prevailing attitudes. My colleagues in many medical schools have been generous with time and advice, and those at the Association of American Medical Colleges have also been most helpful.

The immediate post world War II years were characterized by considerable uncertainty for biomedical science. True, the wartime Federal support for research did not entirely evaporate as it had in past crises, with the termination of hostilities. True, the amount of Federal funding was substantial and growing, but there remained nagging worries about whether adequate funds for research would really be available, especially from the Federal Government, on a stable and dependable basis. Thus, 1956 was a watershed year. The event that first captured the attention of biomedical scientists was what the Congress did to the President's appropriation request for fiscal year 1957. Congress more than doubled it. But the earlier enactment of Public Law 84-835, the Health Research Facilities Act of 1956, did not register immediately. It would take many months to create the administrative structure to operate the program, to solicit and process applications, and to tender awards. Gradually, however, on campuses large and small, from east to west, from north to south, all across the country, excavations were dug, cranes were erected, and research laboratories began to materialize. These happenings had an electrifying impact on aspiring scientists of my generation. They constituted—if you would excuse the word play—concrete evidence of a long-term Federal commitment to research

in the biological and medical sciences. The unmistakable message was that a career in biomedical science was now a viable option, not an impossible dream. The ebullient optimism evoked in so many of my contemporaries by this visible manifestation of a permanent Federal presence in the Nation's research enterprise is unforgettable.

Now, I am responsible for trying to create the same kind of environment at one 30-year-old institution that was once assisted by this program. I am not doing well.

The HRF program was not the first venture of the NIGH into providing support for creating new or remodeling old space for the performance of research, nor would it be the last. From 1948 to 1950, the National Cancer Institute had been authorized to spend a total of $16.3 million on research facilities, while in 1950, the then National Heart Institute had obligated $6.059 million for similar projects related to heart disease. Funds for the construction of the seven national primate centers, $9.4 million, were appropriated between 1960 to 1962. The Mental Retardation Research Facilities program authorized by Public Law 88-164 had resulted in the investment of $26 million from 1964 to 1968. But by the time its last appropriation for fiscal year 1968 had been spent, the HRF program had by far overshadowed all of these in the impetus it had given to the Nation's burgeoning biomedical research effort.

What did it accomplish? The bare facts can be gleaned from the Seventeenth, and final, Report on Health Research Facilities submitted to the Congress in 1972. I quote:

> Since its inception in 1956, the Health Research Facilities Program has awarded 1,485 grants totalling $473 million to 407 institutions in all State of the Nation, Puerto Rico, and the District of Columbia. Institutions matched these grants with $635 million of non-Federal funds. Upon completion, these projects will have replaced, remodeled and provided new construction aggregating approximately 19 million net square feet of modern laboratory space. It is estimated that some 80,000 persons will work in this space—scientists, graduate students, postdoctoral research fellows and trainees, technicians, animal handlers, clerks and other supporting staff.
>
> This program has provided Federal funds for the construction and remodeling of health research facilities at health professions schools, biological science departments in university graduate schools, research institutions, hospitals, and state and local health and mental health departments.

Make no mistake—this was a big program. If translated into 1989 dollars, annual expenditures were equivalent to about $175 million, with total outlays for the 12-year period exceeding $2.1 billion. Moreover, these were the days when even an inflation-adjusted dollar bought a good deal more building than it does today.

I cannot tell the committee precisely which of the spectacular scientific advances of the last several decades came from which of the 1,482 projects, that built or remodeled the 19 million net square feet of work space, in which 80,000 scientists and their support staff pressed the frontiers of knowledge and understanding. But I have no hesitancy whatsoever in assuring you that biomedical science could never have attained its current level of sophistication had the HRF program not been created; nor would the world have witnessed the extraordinary advances in medical practice that scientific discovery has made possible.

How much of a dent did it make on the problem? In 1968, just about 20 years ago, the NIGH commissioned a comprehensive national survey of the facilities used for biomedical research to collect information on the amount, age, and condition of such space, the amount currently under or firmly scheduled for construction, additional needs to relieve current overcrowding, and estimated requirements for reasonable comfort by 1980. The results of the survey reported in 1969 showed that of the 41.4 million net square feet of space then in use, 45 percent was more than 10, and 25 percent more than 30 years old; 16 percent needed remodeling and 9 percent replacement; an additional 14.8 million net square feet were required to relieve current overcrowding; the space then under construction or being remodeled would meet only 40 percent of the current needs, and by 1980, an additional 17 million net square feet of space would have to be remodeled, and 54 million net square feet of new space would have to be added.

Since the 41.4 million net square feet inventoried in 1968 included most of the 19 million net square feet built or remodeled under the Health Research Facilities Program, the latter accounted for about 45 percent of the total and about 60 percent of the usable space, that is, not in need of remodeling or replacement.

Clearly, the Health Research Facilities Program had made a dent. Equally clearly, it did not solve all of the problems that existed at that time.

What has happened subsequently? The expansion of the research program of the National Cancer Institute, the "War on Cancer", included funds for research facilities, and from 1972 to 1982, almost $300 million in current and almost $700 million in constant 1988 dollars were invested in space for cancer research. More recently, modest funds for construction have become available for AIDS research. But by and large, formal Federal Grant support programs for the construction of new or the remodeling of existing research facilities have been small and highly-targeted.

New construction and remodeling have not, however, come to a halt. Many research-intensive academic institutions have invested heavily in facility construction and/or repair from either State appropriations, endowments, gifts or borrowing. Unfortunately, the 1986 tax reform legislation limited access of the institutions most in need of it to tax-exempt borrowing. In the case of private schools, this has required the diversion of precious multipurpose resources to the public purpose of sharing with the Federal Government the cost of Federally-sponsored research. A fraction of these investments is potentially recoverable through indirect cost reimbursement—an undependable and risky route. Absent a formal general-purpose program, institutions facing critical needs have been tempted to seek funding through direct earmarks in appropriations legislation, and some have succumbed to that temptation. The very fact that a procedure as alien to Federal science support as direct Congressional earmarking of grants for facilities, without benefit of any merit review, could come into widespread use suggested the existence of a problem on a significant scale. I assume that Dr. Barnes, my colleague, will highlight the findings of the recent National Science Foundation survey that documents the magnitude of this problem.

In closing, Mr. Chairman, let me say that the bill before the committee today is modeled on a law that exerted a tremendously positive influence on the development of modern biological and medical science. As a result, the opportunities for further advances abound. But scientists cannot exploit these opportunities without laboratories and other facilities. We have the work force in academe; we need the workplace.

I thank you.

The CHAIRMAN. Dr. Barnes?

Dr. BARNES. Mr. Chairman, thank you for this opportunity to testify on the subject of biomedical research facilities. I have submitted my testimony to the committee, and I will abbreviate my remarks for this presentation.

The nature of the research facilities problem is becoming clearer, thanks in part to the attention which has increasingly been paid to it by the Congress. The 1986 NSF authorization requires that the Foundation conduct a survey every 2 years "for the purpose of identifying and assessing the research facilities needs of universities and colleges", and the fiscal year 1989 House Appropriations Report for DHHS called for the Secretary to submit a report to the committee expressing his views on the question of facilities.

Two of the biennial NSF reports have been submitted to the Congress, the last in cooperation with the NIGH. DHHS has just completed its "Report on extra mural Biomedical Research Facilities Construction" for the House Appropriations subcommittee.

The most recent biennial survey by NSF and NIGH provides several clues to the condition and adequacy of facilities in many disciplines, including the medical sciences and the biological sciences. Thus, while the condition of current space was reported as either "suitable for the most sophisticated research" or as "effective for most uses", about 60 percent of the biomedical sciences reported the amount of research space as inadequate by almost half in the case of biological sciences and 40 percent for the medical sciences.

A lot, however, is being done. Twenty-four and 30 percent of the biological sciences and medical sciences, respectively, reported major repairs or renovations affecting about 12 percent of their existing research space. This represents an investment of about $1.8 billion over the period 1986–89 and affects about 14 million net assignable square feet.

NIH reports planned facilities construction of $1.1 billion in 1986–87 and $2.1 billion in 1988–89, which would add almost 12 million square feet in new research space.

However, the statistics on deferred investment are less reassuring. For all academic biomedical research, $1.63 in construction and $2.18 in repair and renovation are being deferred for every dollar that is being invested.

Let me turn now to the current DHHS report on facilities. Included in that report is a helpful characterization of the university research facilities problem or, more accurately, problems, as: 1) maintaining facilities to current research standards, simply to keep pace with building deterioration and changing research and technology needs over time; 2) creating and sustaining facilities to meet the needs of emerging Fields of science, such as might be represented by AIDS or mapping of the human gnome; 3) broadening the

pool of research institutions beyond the top 50 and including minority institutions; and 4) creating or modifying facilities to meet the requirements imposed by regulatory changes.

The pending USDA/APHIDS standards for care of laboratory animals are a striking near-billion-dollar example.

The DHHS report proceeds to examine each of the four research facilities problems in terms of financing strategies—that is, direct Federal funding, Federal indirect funding such as indirect cost reimbursements to Federal awarders, and tax-exempt financing; State or local government funding, primarily for public colleges and universities; private gifts or partnerships, and institutional funding.

I talk about each of these in the written testimony, but would say here only that each of these turns out to be limited and perhaps increasingly so. We have got caps on tax-exempt financing for the private institutions; the pressure to reduce indirect cost is a constraint in that vein; more States, certainly in the case of Virginia, are increasingly uncertain about their economic prospects and are less willing to commit to capital outlay.

Each of the Federal indirect cost mechanisms for investment and research facilities, tax incentives for private giving, tax-exempt financing, indirect cost recoveries, are increasingly less accessible.

As for a formal direct Federal investment in research facilities, NIGH has not had a funded program of any scale for over 20 years.

Mr. Chairman, if facilities provisions in the National Research Institutes Reauthorization Act of 1988, S. 2222, which was passed by the Senate, would go a long way toward correcting the deficiencies in university biomedical research facilities as well as striking a responsible balance between renovation and construction and between governmental and recipient investment.

In the absence of a formal Federal direct facilities investment or more effective Federal indirect mechanisms, there has been a surge in another, informal Federal investment—earmarking—or the provision in legislation in funding of specific facilities without prior agency review or approval. Unlike virtually every direct funding proposal, earmarking does not leverage the Federal investment through requirement cost-sharing.

Estimates vary as to the total investment via this mechanism recent study by the University of California suggests an approximate doubling in earmarking since 1985 to over $202 million in 1989—but there is no question that the practice is growing and will continue to do so in the absence of avenues such as that included in S. 2222.

The question is less whether the individual earmarks are worthwhile—most certainly are—but whether this should or will be a dominant mechanism for Federal investment in university research facilities.

In closing, the Federal Government makes the major share of the national investment in basic research, most of which is conducted in universities by the current and future scientific leadership of the country.

A much greater investment in research facilities seems unavoidable, then, whether our purpose is to maintain our present capabilities, tackle new, devastating or promising scientific challenges,

expand the base of research participants, or meet social and legal research responsibilities.

Thank you.

The CHAIRMAN. Thank you very much.

[Prepared statement of Dr. Barnes follows:]

PREPARED STATEMENT OF DR. DENNIS BARNES

Mr. Chairman, Members of the Committee, thank you for this opportunity to testify on the subject of biomedical research facilities. My name is Dennis Barnes, and I am Associate Vice President for Governmental Relations at the University of Virginia. I testify today on behalf of my colleagues at the University, the Association of American Universities (AAU), and the National Association of State Universities and Land-Grant Colleges (NASULGC) whose members include over 176 universities representing most of the nation's research universities. The Association of American Medical Colleges (AAMC) also supports the recommendations in this report.

"Twenty-two years ago, a French editor and future cabinet minister, Jean-Jacques Servan-Schreiber, rocked Western Europe with a book called The American Challenge. Keep pace with technology the way America is doing, he warned, or you'll lose your place in the world."

That is the lead paragraph for an interview with Mr. Servan-Schreiber in the July issue of Challenges, the newsletter of the Council on Competitiveness. It is worth noting that the interview was conducted at Mr. Servan-Schreiber's office at Carnegie Mellon University in Pittsburgh, which he views "as perhaps the prototypical new American city because brain power is the key to its new prosperity. Universities and hospitals are the two major employers, not the steel industry anymore." He told the interviewer that "America's great research universities are the last bastion of Western superiority. They are developing new sciences and innovations. They are attracting top students from around the world (which he sees as proof of where the world sees the best education to be)... And they (the universities) are truly 'international,' like none other in the world; they need to remain centers of excellence." "The real American treasure today is brain power - nothing else approaches it." And, "If America remains number one in educating people to excel, this will be everything."

If Mr. Servan-Schreiber is as prescient in his observations this time as he was 22 years ago, we should feel flattered and forewarned; "forewarned" because our research universities are increasingly constrained in their abilities to offer the best educational research training and to conduct the most competitive research by the facilities available for those purposes.

The nature of the research facilities problem is becoming clearer, thanks in large measure to the attention which the Congress has increasingly devoted to understanding it. Two of the major actions affect the most important federal basic research agencies, NSF and NIH, both of which are under the attentive jurisdiction of this committee. The 1986 NSF authorization requires that the Foundation conduct a survey every two years

"... for the purpose of identifying and assessing the research facilities needs of universities and colleges," and the FY 1989 House Appropriations Report for DHHS called for the Secretary to submit a report to the Committee expressing his views on the question of facilities. Two of the biennial NSF reports have been submitted to Congress, the last with the NIH, and DHHS has just completed its "Report on Extramural Biomedical Research Facilities Construction." I have had the privilege of participating in each of these efforts and certainly sense significant improvements in the quality of information and insight which is available. A more detailed list of studies of the facilities problem accompanies this statement.

The most recent biennial survey by NSF and NIH, Scientific and Engineering Research Facilities at Universities and Colleges: 1988, provides several clues to the condition and adequacy of facilities in many disciplines, including the Medical Sciences and Biological Sciences. Thus while the condition of current space was reported as either "suitable for the most sophisticated research" or is "effective for most uses," by 61% of the Medical Sciences and by 63% of the Biological Sciences, the amount of research space was judged inadequate by almost half of the Biological Sciences and by about 40% of the Medical Sciences.

Between 24% and 30% of the Biological Sciences and Medical Sciences, respectively, reported major repairs or renovations of about 12% of their existing R&D space. The percentage of the total costs of recent repairs or renovations and for construction of new R&D space for all reporting disciplines was notably higher for the Medical Sciences and the Biological Sciences. While this indicates a substantial investment in correcting the facilities deficiencies, the statistics on deferred investment are less reassuring. In the case of the Medical Sciences, $1.44 in construction and $2.10 in repair and renovation are being deferred for every dollar that is being invested in each category. For the Biological Sciences the ratios are $2.40:$1.00 for repair and renovation and $2.01:$1.00 for construction.

Let me turn now to the current DHHS report to Congress on facilities. Included in the report is a helpful characterization of the university research facilities problem or, more accurately, problems, as:

- "Maintaining facilities to current research standards," ... "simply to keep pace with building deterioration and changing research and technology needs over time;"

- "Creating and sustaining facilities to meet the needs of emerging fields of science," such as might be represented by AIDS or mapping of the human genome;

- "Broadening the pool of research institutions beyond the Top-50 and including minority institutions;" and

- "Creating or modifying facilities to meet the requirements imposed by regulatory changes;" the pending USDA/APHIS standards for care of laboratory animals are a striking near-billion dollar example.

The DHHS report proceeds to examine each of the four research facilities problems in terms of financing "strategies," i.e.:

- Direct federal funding;
- Federal indirect funding, e.g. indirect cost reimbursements to federal awardees and tax exempt financing;
- State or local governmental funding, primarily for public colleges and universities;
- Private gifts or partnerships;
- Institutional funding.

We gave particular attention to the last four of these, recognizing that new or additional "direct federal funding" will be very difficult to secure; appropriating significant facilities funding to the proposed program budgets of recent years has not been proved practicable. The research faculty want first and foremost to protect and increase the funding of project research, and unfortunately the proportion is dropping of proposals which are both carefully and highly recommend and that are also funded.

Of "federal indirect funding" we found that:

- there is cautious interest in OMB and DHHS in permitting some increase in the "use allowance" for research facilities which are funded from sources other than the federal government. Currently universities are permitted to recover 2% per year of the original cost of such facilities; an increase of a few percentage points or a shift to a realistic depreciation allowance would greatly improve the longer term ability of active research centers to maintain the currency of their research facilities; major current facilities shortcomings would not be much affected;

- tax exempt financing, which has been the primary funding mechanism for the major private research universities, was essentially capped at $150 million per institution in the 1986 Tax Reform Act. The 1988 NSF/NIH facilities survey reported that 11 of the 19 private institutions in the Top-50 have reached their limit. The very best research institutions therefore must assume even greater risk to maintain world competitive facilities.

State and local governmental funding has taken on greater significance in some public institutions (the NSF estimate is 53% overall) and seems to be growing, particularly as states and localities associate universities with economic development. However the impact is spotty and negligible for the private universities (the NSF estimate is 3%).

Private gifts have long been and are an important factor in new buildings - NSF surveys indicate that 11% of public and 35% of private research facilities funding is derived from these sources. Again changes in the Tax Reform Act of 1986 have notably reduced incentives to private giving and donations overall were down notably in 1988.

"Institutional funding" is a general term for various discretionary funds which NSF estimates account for about 15% of the public and 24% of the private research facilities investment. A major component of these funds at many institutions is indirect cost recoveries from research grants and contracts which are often thought of erroneously as redundant or arbitrary. Indirect costs are "redundant" only in the sense that institutions have already paid the costs, which are nevertheless clearly attributable and necessary to the conduct of the research with which they are associated. The case of the University of Virginia may be illustrative; the Commonwealth specifically permits the University to retain most indirect cost recoveries ($15.6 million in FY 1988) for the support of the research activity. Of the $10.9 million retained by the University that year, $6.5 million was committed to research facilities construction and renovation. Unfortunately the pressure to limit or reduce federal indirect cost reimbursements is strong and growing; for example, the House is now considering an arbitrary 25% indirect cost limit (the average among institutions is closer to 50%) for competitive research grants in USDA.

Therefore each of the federal indirect mechanisms for investment in research facilities - tax incentives for private giving, tax exempt financing, indirect cost recoveries - is increasingly less accessible.

As for a formal direct federal investment in research facilities, NIH has not had a funded program of any scale for over 20 years. The NSF Academic Research Facilities Modernization Act (P.L. 100-57) was very welcome, but an appropriation has yet to be made. Mr. Chairman, your facilities provisions in the National Research Institutes Reauthorization Act of 1988 (S. 2222), which was passed by the Senate, would go a long ways towards correcting the deficiencies in university biomedical research facilities, as well as striking a responsible balance between renovation and construction and between government and recipient investment.

In the absence of a formal federal direct facilities investment or more effective federal indirect mechanisms there has been a surge in another, informal federal investment; "earmarking," or the provision in legislation for funding of specific facilities without prior agency review or approval. Unlike virtually every direct funding proposal, earmarking does not leverage the federal investment through required cost sharing.

Estimates vary as to the total investment via this mechanism (a recent study by the University of California suggests an approximate doubling in earmarking since 1985 to $202 million in 1989), but there is no question that the practice is growing and will continue to do so in the absence of avenues, such as that included in S. 2222. The question is less whether the individual earmarks are worthwhile - most certainly are - but whether this should or will be a dominant mechanism for federal investment in university research facilities.

In closing, a much greater investment in research facilities is unavoidable, whether our purpose is to maintain our present capabilities, tackle new devastating or promising scientific challenges, expand the base of research participants, or meet social and legal research responsibilities. The Federal government makes the major share of the national investment in basic research, most of which is conducted by the current and future scientific leadership of the country. We hope that they will have facilities commensurate with the task.

A Selected Bibliography of Recent Studies on the Status of Research Facilities

1978, National Academy of Sciences, National Survey of Laboratory Animal Facilities and Resources, Findings:

- 50% of the 992 NIH-grant eligible institutions needed more space.
- Over 33% reported a need for renovation of facilities.

1981, Association of American Universities, Nation's Deteriorating University Research Facilities, Findings:

- Respondents spent over $400 million from 1978 - 1981 for construction, modernization major repair and renovation of research facilities, and for special purpose equipment with almost no new construction.
- Respondents reported an estimated need of $765 million for the next three year period for facilities and equipment to sustain current activity level of existing faculty.

1983, National Academy of Sciences, National Academy of Engineering and Institute of Medicine, Strengthening the Government-University Partnership in Science: Report of the Relationships in Support of Science of the National Academy Complex, Findings:

- Deterioration and obsolescence of research equipment and facilities threaten the quality and productivity of U.S. research and education.
- A deficit estimated to range between $1 to $4 billion was identified.
- The need for a sustained, comprehensive program providing for construction of facilities and development, acquisition, maintenance and operation of modern equipment was identified.

1985, (prepared for the American Cancer Society), Survey of Cancer Research Facilities Needs, Findings:

- 4.7 million net square feet of new space and 1.4 million square feet of improved space costing $2 billion are needed by 1990 in order to accomplish stated goals.

1986, Government-University-Industry Research Roundtable, Academic Research Facilities Financing, Findings:

- The need for construction and renovation of facilities in the next 10 to 20 years will range between $5 and $20 billion.

1986, National Science Foundation, Science and Engineering Research Facilities at Doctorate Granting Institutions, Findings:

- 95% of the 165 respondents reported that they needed more research space, and that the present facilities are limiting research.

1986, White House Science Council, A Renewed Partnership, Findings:

"One conclusion is clear: our universities today simply cannot respond to society's expectations for them or discharge their national responsibilities in research and education without substantially increased support."

- WHSC estimates that $10 billion is the necessary minimum required over the next ten years for university and facilities equipment.

- The federal government must make substantially greater investments in centers of learning in the 1980's and 1990's than in the 1970's. *"The recommendations set forth in this report, if they are to be implemented fully, require significant increases in financial support.,,,More rapid growth is essential if our universities are to meet the burgeoning demands being made upon them from almost every sector of our society. The federal government is the only practical source of funding for the major part of this growth."*

1988, National Science Foundation, Scientific and Engineering Research Facilities at Universities and Colleges: 1988, Findings:

- It would cost approximately $3.6 billion to undertake all the repairs and renovations needed in university research facilities for 1988 and 1989 alone.

- 39% of all research space is judged to be in need of limited or major repair to be used effectively.

1988, Association of Physical Plant Administrators, and National Association of College and University Business Officers, The Decaying American Campus: A Ticking Time Bomb, Findings:

"America's deteriorating college and university facilities require substantial capital investment. With an estimated $60 to $70 billion in capital renewal and replacement needs, some $20 billion of which is urgent or priority in nature, the reinvestment requirements are staggering."

- The largest part of *urgent* needs belongs to the nation's 104 research universities, with an estimated need of $7.2 billion.

1989, National Institutes of Health, The Status of Biomedical Research Facilities, 1988, Findings:

- The amount of available research space was commonly rated as "generally adequate" (39 to 54 percent) and "inadequate" (24 to 51 percent). Research organizations and hospitals showed higher proportions of space rated "adequate"(15 to 25 percent) than academic institutions (1 to 13 percent).

- It was estimated that for each $1.00 of planned 1988-89 biomedical construction at academic institutions, $1.63 in needed repair is deferred.

- Academic institutions are deferring $2.18 in needed repair/renovation of biomedical research facilities for every $1.00 of R/R planned for 1988-89.

1989, Association of American Universities, and National Association of State Universities and Land-Grant Colleges, University Research Facilities: A National Problem Requiring a National Response, Conclusion:

"Responding universities appear unanimous in the view that no addition surveys, studies, or reports documenting the need for research facilities are required. Action to provide serious, organized programs for the construction and modernization of academic laboratories ought to be the next, prompt step."

1989, Department of Health and Human Services (Office of the Secretary), Report on Extramural Biomedical Research Facilities Construction, Findings:

"Despite the obvious need for a sound research infrastructure, investments in facilities are often deferred in favor of shorter term needs. The reports developed by the NSF and the NIH point to a pattern of deferrals, despite the strong commitment to research by the nation's research institutions and the several levels of government and other private organizations that have participated in supporting research. Direct funding of facilities by the federal government was reduced substantially in the 1960's."

The CHAIRMAN. I'll plead guilty to some of those earmarking myself—out of great frustration, quite frankly, as to the cutbacks in all these programs, and as one who has been involved, the process is not moving ahead. It is basically out of a serious, continuing and significant frustration about any movement whatsoever. I know that has not always been the case with others, but it has certainly been my position.

Let me ask you why do you think there has been this decline in support for research facilities; I mean, what has really happened, what has been the change? You are an observer of this whole climate and atmosphere. What has really taken place in the society that has resulted in these kinds of cutbacks and support for research?

Dr. CHALLONER. Senator, I believe that what has happened over the last 20 years is that the previous program did put in place nationwide a sound physical plant to carry on this national endeavor. Over time, that investment has eroded. The enterprise has continued to grow, dramatically so—if you wish to tie it, for instance, to the increase in the appropriation to the NIGH as it has trailed after the good science that is leading it.

Our attention has not been brought back to the matter. The national budgets have become more constrained, and therefore the investment for the future rather than the payment for the individual current research project has been put off. We have put it off too long; we now have to look to our future and facilities.

The CHAIRMAN. What will be the result if we don't respond to the challenge and if we don't become serious about investing in these kinds of facilities?

Dr. CHALLONER. In my view, it will seriously constrain the ability of our country to capitalize on the intellectual capital that we already see in the biomedical research enterprise.

The CHAIRMAN. I don't know whether you have some reaction to the amounts. We are all conscious of the restraints, of what is possible, what is not possible. I would ask both of you, Dr. Challoner and then Dr. Barnes made some reference to it. Maybe you could take a bite of it.

Dr. CHALLONER. I believe the amounts that have been discussed in relationship to the current legislation—somewhat similar to the total amount that may have been annually expended in the earmarking process in the last several years; similar to an amount that, when brought to current dollars, existed in the previous program—would certainly begin to do several things. It would allow us to bring forth applications from institutions to assess the true depth of the national problem just in terms of the information that would be provided in the applications process.

Second, it would show us just how much leveraging of Federal moneys in terms of the match requirements could be done by the current approach, and then it would give us data to, as I said, begin to deal with the problem and understand its size in order to craft whatever the next legislative step might be.

The CHAIRMAN. Dr. Barnes?

Dr. BARNES. Mr. Chairman, I think my comment on that would be using the NIGH and NSF reports as to what they feel is deferred in both renovation and in construction, if we were to do the

identified repair and renovation that the institutions cite, that would take about $1.3 billion, as is currently identified.

In the case of space shortages, that is, new space, we are talking about something like $3.4 billion in construction, so that would be a reference point.

The CHAIRMAN. One of the points we have not really dwelled on is the additional demands on these research facilities—for example, the gnome research, AIDS research, additional regulation in use of various animal products which have put an additional burden on them, even as there has been failure to bring a modernization or investment program.

I don't know whether you can quantify that or give us some idea as to how serious these additional kinds of requirements have been on these facilities.

Dr. BARNES. The DHHS report which was just completed characterizes the problem just as you did—those categories. It does not quantify them. The only reference point—it would only be one example—would again be the example of meeting the USDA animal regulations, proposed regulations, which are now estimated to approach perhaps $1 billion. That would be simply to meet a regulatory requirement.

The CHAIRMAN. What is your own assessment of the amounts of resources that are out there, Dr. Barnes, from the private sector?

Dr. BARNES. There is a good bit that people have been using. The colleges and universities reported that something like 17 percent of the moneys that they were putting into construction and renovation come from private sources. That figure is 24 percent in the case of the medical schools. But certainly the tax laws have reduced that incentive, and I think the figures you will see over the last year show that the private gifts are going down.

Again, that money is primarily available for construction. It does not deal with the renovation and repair. The best illustration I could give you is the case of Clark (OH) at the University of Virginia, which was the law school when you were there. We converted that when the law school moved to Department of Environmental Sciences. Try as we might, we could not get any private money for that, although we could raise $1.3 million to help fund the new law school. New buildings are easier to raise money for than are the retrofitting of old buildings.

That building, however, which we did convert on sort of a jury-rigged basis with institutional and State funds, now supports research on global warming, acid rain, tidal wetlands, to the tune of about $3 million a year. So that shows how difficult it is to do the renovations.

The CHAIRMAN. Very good. I am hopeful of having another nephew down there at the law school next fall.

Dr. BARNES. Yes, I know.

The CHAIRMAN. I want to thank you all very much.

This is a subject that we are going to continue to pursue. I think we made some progress last year. We have run into some other kind of peripheral issues over in the House which has to be addressed for us to make some really meaningful progress. But I think we are making progress in terms of increasing support just

generally in the institution. It is far too long to do it, but we are very grateful to you for your comments and your testimony.

Thank you very much.

The CHAIRMAN. Our third panel will include Dr. Wilson, who recently became president of Radcliffe College. She is representing the University of Michigan, where she was until very recently Vice President for Research.

We also have Dr. Langer, who is representing the University of California at Los Angeles; Dr. Satcher represents the Harry Medical College and the Association of Minority Health Professions Schools.

Dr. Wilson, I do not know whether you have become a constituent or not yet, but we hope you will have a very successful and illustrious career at Radcliffe, as you had in your previous endeavors. We are very glad to have you here.

We'll start off with you.

STATEMENTS OF DR. LINDA S. WILSON, PRESIDENT, RADCLIFFE COLLEGE, ON BEHALF OF THE ASSOCIATION OF AMERICAN UNIVERSITIES; DR. GLENN A. LANGER, ASSOCIATE DEAN FOR RESEARCH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA, ON BEHALF OF THE ASSOCIATION OF AMERICAN MEDICAL COLLEGES; AND DR. DAVID SATCHER, PRESIDENT, HARRY MEDICAL COLLEGE, NASHVILLE, TN, ON BEHALF OF THE ASSOCIATION OF MINORITY HEALTH PROFESSIONS SCHOOLS

Dr. WILSON. Mr. Chairman, thank you very much for those kind remarks—and yes, indeed, I have become a constituent. I am on the job already at Radcliffe.

What I would like to speak with you about today is really drawn more from my experience as Vice President for Research at the University of Michigan and more than 20 years of concern over the research environment at other major research universities.

I believe you realize that I am speaking to you also on behalf of the Association of American Universities, a group of 56 of the Nation's leading research universities.

What I would like to do—because I realize that your time is short and that the best thing for us is a dialogue rather than the presentation, especially since we have submitted written testimony—is to summarize for you the ways in which inadequate research facilities affect graduate education and research.

I point to this because we are at a very critical juncture in our Nation as we try to make sure that we do in fact attract the best and the brightest, or at least a very good share of them, to these biomedical and behavioral research careers, to the academic profession as well as to industry; and we are deeply concerned that the deteriorating facilities within the American universities are having a detrimental effect on our ability to recruit those individuals both as students in the pipeline and also as continuing faculty during the course of their careers.

If you look at the way in which facilities affect graduate education and research, let me summarize those briefly. They do indeed affect the quality and the quantity and the productivity of the research. Overcrowding of the facilities, deteriorating facilities, lack

of environmental control, can lead to data that is invalid; it can stifle the imagination of the (AK) people; it can constrain them so that what they produce is conservative science rather than lifting their horizons and enabling them to pursue in a very creative way new breakthroughs.

The quality of the research is very intimately linked with the quality of the facilities. What I would like to do is to give you a very few examples from my experience recently at the University of Michigan and then to draw a little bit on some of my colleagues' experience at other institutions.

I recently had occasion to review some of the facilities in the medical school at Michigan in order to respond to a request for internal resources that the institution could have brought to bear. We did not respond positively because the medical school could not tell us that these particular cases were the most important, highest-priority items on their agenda, and yet they were crying needs.

In one case, the laboratory—about the size of a regular, ordinary research laboratory—included 15 different people—students, post docks, and one faculty member. They were running three shifts with the same bench space being used by different people at different times of the day so that research setups had to be taken up and taken down in order to accommodate the number of people who needed to live in that laboratory.

What is amazing to me is that our (AK) people have still stayed around to participate in that kind of space crunch. I don't think that we can expect to have that continue for long.

I went down, then, two floors below in the medical school to visit another laboratory where one of our most distinguished new department heads has a going concern in positron emission topography and other kinds of advanced imaging tools. There, he had the space in terms of the square footage, but because this space had been created in the past for another era of research when one needed very heavy soundproofing in order to do audio research, we could not afford to break down those heavy walls and take the various square footage and convert it to the kind of space he needed for current, contemporary research—two examples of mundane renovation, realignment that were needed and which we cannot do at the University of Michigan despite a rather sizable amount of external support for our research, both from the private sector and from the State.

These kinds of concerns, limits on the space, hit us so hard at the University of Michigan that about two years ago, the associate dean for research in the medical school took the unprecedented step of issuing a memorandum to all faculty and department chairs saying that there will be no new projects taking place in this medical school unless an existing project is stopped and the space converted. We simply run out of space for the research activities of a very talented faculty which is competing with great ease in the national competitive NIGH Grant system.

My colleagues at Johns Hopkins tell me that the same thing is going on there. What we are doing, therefore, is denying the country the benefits of the research prowess of these very talented individuals because we cannot realign the space that we own or construct additional space without additional sources.

At the University of Minnesota and at many other institutions, my colleagues tell me that the laboratory animal facilities are in need of considerable upgrading and that the new regulations that may be coming out of APHIDS will challenge us enormously. My colleague, Dennis Barnes, just mentioned a Price tag of $1 billion.

Let me reiterate that we see this as a tragedy for the ongoing kinds of research that could benefit individuals suffering from disease and illness and disability; we see it as a tragedy because we are not going to be able to continue to attract (AK) people into this career unless we can come to grips with this problem.

It is not the Federal Government's sole responsibility by any means. Indeed, the $1.775 billion invested annually in research by colleges and universities comes about 30 percent from State and local governments and about 20 percent each from the institutions' own funds, private funds and tax-exempt debt. That can continue, but $1.775 billion is not enough to meet the need, and we are very pleased to see the bill that you are proposing here, and we want to offer our very strong support for it.

I would be happy to answer questions if that would be appropriate, but that would be my testimony.

The CHAIRMAN. Thank you very much.

[Prepared statement of Dr. Wilson follows:]

PREPARED STATEMENT OF DR. LINDA S. WILSON

Mr. Chairman and Members of the Committee:

I am Linda Wilson, President of Radcliffe College. A little over three weeks ago, I concluded my former position as Vice President for Research at The University of Michigan. I am very grateful for the opportunity to appear before you as a new constituent to discuss the need for university facilities for biomedical research. On behalf of the Association of American Universities (AAU), a group of 56 major research universities, I also wish to thank you for your leadership on this important issue.

Today, I wish to describe some of the effects of the deteriorating biomedical research facilities on university campuses. My views are based on my previous responsibilities over 20 years for maintaining the research environment at several leading universities. I have been particularly concerned with strengthening the bond between research and graduate education -- a unique and crucial component of the U.S. research enterprise. The U.S. is now at a critical juncture in determining whether we will have an adequate number of graduate scientists available for industry, government and university needs in the coming years.

Research facilities are indispensable to the mission of the modern research university. The steady deterioration of university laboratories has far-ranging effects on the quality and quantity of ongoing research, the capacity and willingness of researchers to propose creative future research, the quality and availability of necessary research experience for graduate students and younger scientists, and the willingness of students to pursue careers as researchers.

The state of research facilities influences present research in many ways. Clearly, research facilities have an effect on the validity of research results. Inadequacies in environmental control limit the quality of data. Crowding limits the access to research facilities and reduces the number of experiments that are undertaken. Physical deterioration and overload lead to downtime, which seriously affects productivity. A recent survey of a sample of NSF-funded investigators found that 60 percent reported having lost some time in the preceding year because of facilities-related failures. Scientific areas that rely on computerized data acquisition require air conditioning. Inadequate provision for air conditioning yields downtime on the order of 50 percent during the summer months in some instances.

Old buildings accommodate current scientific purposes with difficulty. Their systems for distributing utilities and services cannot satisfy current scientific demands. Their construction is rarely adequate for experiments that are sensitive to vibration or that demand a dust-free environment. They have only limited flexibility for rearrangement to locate related groups of scientists near each other. Productivity diminishes as students and faculty spend time traveling among laboratories and gaining access to needed instrumentation.

The degree of collaboration and interaction among scientists and students is affected by physical facilities. Close proximity of personnel is important for effective scientific communication. The sharing of instrumentation and laboratory facilities can stimulate and facilitate the development of collaborative scientific efforts. The growing need to share major research instrumentation may encourage the development of new disciplines at the interfaces of traditional disciplines. When individual research groups are dispersed because contiguous space is not available, interaction is reduced, and the quality of research supervision and training may be undermined as well. The new communications technologies may overcome some of these difficulties, but face-to-face interaction still plays a key role in the stimulation and development of ideas among scientists.

Physical facilities also affect university responsiveness to regional and national interest in the transfer of knowledge and technology to industry. University-industry cooperative research in many cases includes small technology intensive businesses. Few of these organizations have their own internal research facilities. They must, therefore, rely on university facilities to house collaboration. Cooperative research arrangements may be of short duration, so the design of the research facilities must remain flexible.

The deterioration of research facilities has a critical influence on the development of research ideas and plans. Overcrowding, inflexibility of space, and inadequacy of environmental controls can stifle the imagination of students and faculty, especially if they perceive little or no opportunity for improvement. The ability to take advantage of new directions in research is also limited by facilities. The exploitation of scientific opportunity depends on the availability of funds for realignment of laboratory space.

Limitations on facilities can also lead to conservative science. Those whose experimental efforts are limited to what can be accomplished at shared regional and national facilities worry that the processes used to determine access will discourage lines of inquiry that have a high payoff but are speculative.

The adequacy of research facilities is crucial for recruiting and training the next generation of scientists. The ability of each graduate student to develop as an independent investigator is affected by the facilities and the instrumentation available. Perhaps the most serious effect of inadequate facilities is on the recruiting and retentionof the most productive faculty members. The erosion of academic facilities is

seriously limiting the attractiveness of the academic profession for some of the best and brightest of both new and senior scientists. Failure to overcome such disincentives will seriously affect the universities' role as a major research performer and as the primary providers of advanced training.

Specific Effects at Sample Universities:

About two years ago, the Associate Dean for Research and Graduate Studies of the University of Michigan School of Medicine sent a memo to the faculty and Department Chairs in which he simply stated that there was no more research space available in the Medical School facilities. [see attachment] The space in both existing structures and those under construction was fully committed and from that time on, Department Chairs would have to demonstrate how each proposed research effort would be housed by taking away space from existing research efforts.

While I fervently agree that it is always necessary to develop priorities for expensive research space, and that particularly in times of budget austerity, greater efficiencies must be found, we might reflect a moment on the implications of this statement by the leadership of the Medical School.

The University of Michigan (UM) is awarded about $80 million annually by the NIH to perform biomedical research. The School of Medicine is ranked in the top dozen in the nation with respect to the amount of NIH research funds that are won annually in competition with some of the best biomedical researchers in the world, at other U.S. universities and non-profit institutions. To deny these world-class UM biomedical researchers adequate research space for either their ongoing or proposed research efforts is to deny the nation the potential of research breakthroughs in understanding the basic science that might underlie an illness.

More specifically, the lack of adequate research facilities has blocked the UM Medical school from hiring researchers in areas such as pediatrics and neurology. Researchers in the university's diabetes center do not have the space to accommodate 2 Canadian scientists with whom they have been collaborating and therefore must continue an awkward long distance research partnership.

The renovation of existing research facilities is a critical need as well at the Michigan Medical School. According to an internal planning report on Medical School research facilities renovation and renewal:

> Almost 70% of Medical School space is 20-60 years of age. Much of this space is rapidly reaching the point where it can no longer support modern biomedical research. Building central systems and other infrastructure has reached a deteriorated state such that research is being hampered and personal safety is being compromised.

To make matters worse, the shortage of space makes it very difficult to provide temporary laboratories to researchers while labs are being renovated.

The situation at UM is not unique. In a recent survey of member institutions of AAU, similar difficulties to those of the UM in maintaining its research infrastructure were told repeatedly.

Johns Hopkins School of Medicine has had to limit the amount of research to a level much below what the present faculty are capable of and interested in doing, due to constraints of research facilities. Antiquated animal research facilities are blocking research using appropriate animal models in biomedical fields at the University of Minnesota. Many other public and private universities voiced similar concerns with the inadequacy of their animal research facilities and the high costs to upgrade or expand them to meet the needs of their biomedical research.

Many universities also expressed the desire to undertake additional AIDS related research, but are hindered by their lack of adequate facilities. The University of California comments are an example: "Biohazard containment is not optional and especially designed lab...rooms are needed - for AIDS and other infectious disease research.."

The Effect of the Facilities Crisis on People -- the Most Important Research Ingredient

Inquisitive and active faculty are essential to the quality of research and the education an institution delivers. Most public and private universities responding to the AAU survey reported that recruitment and retention of faculty is being compromised by research facilities shortcomings. The cost to an institution of recruiting and establishing laboratories for young faculty and recognized researchers is high and going up at a rapid rate. A university frequently can expect to face costs of $250,000, $500,000, or more to equip a young person just beginning a research career. The cost of equipping and renovating a laboratory for a recognized researcher can easily exceed these sums. And, as faculty retire in greater numbers during the middle 1990s, the total costs associated with recruiting and equipping new faculty will grow.

Our need for facilities is in inextricably linked to the nation's need for highly trained people. We simply are failing to attract a sufficient number–in some department, any–of the most talented U.S. students into graduate programs in science and engineering. The problems, especially with regard to minorities, women, and the handicapped, is widely reported and generally accepted. The research environment in universities is one component, and an essential component, of the problem. .If we continue to allow this environment to erode–and it is eroding in many leading institutions despite their best efforts–then we will find it even more difficult to attract the best students into doctoral programs and careers as academic researchers and faculty.

Mr. Chairman, I have recounted instances of the effects of deteriorating and inadequate research facilities at some of our nation's leading universities. Although we do not have precise data on these effects, we do know that some of the best minds in the country are hindered in their biomedical research. Inadequate research facilities are also harmfully affecting graduate research education and sending the wrong message to the next generation that a biomedical research career is one rife with frustrations over inadequate support to enable a scientist to undertake his/her chosen work. With the billions of dollars that we invest annually in biomedical research and the dependence our nation's health has on the output of this research community, can we continue risking that our present research investments are not being used as productively as possible, or that we are turning off the next generation to careers in research?

ATTACHMENT

Volume V Number 18 November 2 – November 15, 1987

DEAN'S CORNER

I regret to inform you that the Medical School has completely depleted its inventory of research space. There is no longer any uncommitted space available either in existent structures or in any buildings under construction at this time. All research programs developed by a Medical School unit must include a plan for the utilization of space presently in that respective unit's inventory. Therefore, all grants or contracts forwarded to Medical Administration for processing must be accompanied by a plan for assignment of appropriate space within that unit. At this time we envision no exceptions to this policy.

The implications of such a situation are serious for our dynamic and growing research enterprise. It should be noted that a Task Force assigned by the Dean to address issues of space allocation and reallocation is in the process of producing a final report outlining guidelines for research space utilization. In the meantime, we seek your support and advice in resolving this dilemma, while at the same time we must insist on your compliance with this policy.

Irwin J. Goldstein, Ph.D.
Associate Dean for Research
and Graduate Studies

The CHAIRMAN. Dr. Langer?

Dr. LANGER. Thank you very much, Senator, for this opportunity.

My task is to reduce somewhat the global statistics presented previously by various of the panelists to the more human scale of a single institution and what is going on at the front lines, so to speak, in my institution, which is that of UCLA.

We are a (AK) institution. We were chartered in 1951. We graduated a first class of 26 students in 1955; we graduated 148 students this year. Its intellectual architect and founding dean was Dr. Stafford Warren, himself an investigator of great distinction, who was determined that the school would build a strong research program.

He was greatly aided at that time—this was the late 1950s—and also greatly aided by the granting, under the Health Research Facilities, or HRF, program during that period of nine grants at $6.5 million total. This was awarded to UCLA, indeed to provide the seed money.

That seed really has grown. In the current academic year 1988-89, UCLA School of Medicine reports a total of $144 million in research support—so from a seed of $6.5 million to $144 million. Seventy-eight percent of this is Federal in origin. This will rank either fourth or fifth in the Nation for a school that was started in the last half of this century.

So the figures reflect a remarkable success of individual faculty members in winning NIGH research support in this fierce national competition. For example, as you probably know, in fiscal 1990, the National Heart, Lung and Blood Institute of the NIGH is predicted to fund less than 20 percent of approved applications and virtually none of the support is for facilities.

With this background, let me address some real problems which face us at UCLA. Research turns out to comprise 42 percent of the school's total budget, and the research currently occupies 22,000 net square feet of space. This means that at $144 million total support in the past year, each square foot of research space is generating almost $450. This is an extraordinarily high ratio and points to a serious problem: that there really is critical lack of space in the institution.

Maintenance of the integrity of our research program, including facilities in which it is conducted, constitutes one of the most serious challenges and it influences every aspect of the school's activity—recruitment, tenure and promotion actions.

Let me make certain that we understand why this is so. The stability of the institution's research effort demands that our faculty continue to compete successfully for ever scarcer Federal research funds. Research in our school, as in every other one, is heavily dependent on Federal support—78 percent at the current time, as I mentioned. Success in the recruitment and retention of the competitive research faculty is a function of what the university can offer its members in terms of salary and fringes, but even more importantly, in terms of the environment for those researchers.

Good scientific investigators need space designed for modern research technology, and thus a major task of my office is to make sure that UCLA has an inventory of research space of such size and in such condition that will allow science to be carried out effi-

ciently and effectively, that will enable the school to recruit new and retain existing faculty members distinguished for their research accomplishes and that will permit the institution to compete effectively each year for the most promising graduate students and postdoctoral students.

Otherwise, our research programs will flounder, and the next generation of research work force will not be trained, at least not efficiently, at UCLA.

At the moment, our research facilities are seriously overcrowded and far from the state-of-the-art. People are shoe-horned into laboratories; the fire marshals are continually on our backs, complaining about the hazards caused by equipment which is out in the hallways because there is no room for the researchers if we kept the equipment in the laboratories themselves. Particularly worrisome is the scarcity of vivarium or animal space in relation to need and the condition of the space that does exist.

We have been trying to do something in the private sector in this area, and we have presently under construction a medical research building of 80,000 net square feet—keep in mind our total at the present time is 322,000—built at a cost of $48 million, $600 per assignable square foot of space in Southern California at the present time.

This is being built entirely with private donations—no State or Federal funding—obtained by an extraordinary fund raising campaign in the Los Angeles community over the past 5 years.

Unfortunately, all of this space has been assigned 4 years ago, before we expect the building to open—in other words, this was all taken a number of years ago.

Since our programmatic research funding has been increasing at the rate of about 20 percent a year despite the increasing competition, this includes no funding for space, and we remain in a serious space deficit despite this private fund campaign to raise the new building.

Science is evolving at a rapid pace, but progress continues to depend on measurement—how the details and the minute quantification of measurement in science has become critically important. These require new instruments, and previously unmeasurable properties of systems can be assessed now, and new conceptual vistas now open.

The flip side of this, however, is not only obsolescence of older instruments, but also increasing efficiency in space utilization that shades at variable rates into dysfunctionality and eventually into obsolescence. The area of molecular genetics, for example, has engendered demand for increasingly sophisticated equipment. A standard piece of equipment, in fact, at the low end of the scale in that area costs about $250,000 now. To put this in perspective, our total annual stipend now from the NIGH for biomedical research support Grant which is supposed to fill in the gaps in the institution which are not covered by current granting, our total amount for this year is $282,000. So if we bought one instrument to modernize molecular genetics, we would consume our entire annual basic science research support Grant from the NIGH.

My impression is that UCLA has found it desirable to modernize or renovate research space about every 15 years, and that after

about 50 years, most buildings have to be replaced or gutted for complete interior reconstruction. We are coming to that time at UCLA. Thus on the average for our institution, one-fifteenth of our inventory, or about 21,000 net assignable square feet of space, should be scheduled for refurbishing every year.

What does it cost to modernize? The recent estimate by the Association of American Medical Colleges puts this at about $330 per net square foot. Applying this estimated cost to our one-fifteenth which is required every year, we should be putting $7 million in each year to keep our facilities up to standard. This is clearly no small item in our annual budget.

Dr. Challoner and others noted costs for capital improvement can be included in the overhead rate currently supplied, attached to the grants which we get from the NIGH to the extent that the facility is used for Federally-supported research, through indirect cost reimbursement on Federal grants. Thus the policy and practice governing indirect cost recovery currently in effect allow an institution to recoup only partially its investments in capital improvement, even under the most favorable circumstances.

And circumstances are seldom favorable, so for the most part, we have had so to speak to "eat" a substantial fraction of these costs at our local level.

Our university has just put in a program which is designed to help pay our facility modernization costs to some extent with assignment of a recently-approved 6.5 percent of our indirect cost rate solely for capital improvement. This is at the last stages of litigation, but I think probably will be passed. But at all schools, Government funding is woefully inadequate, and both public and private schools have had to scramble for funds from a multitude sources, gifts, endowments, discretionary funds, practice plan contributions, and so on—witness our new research building at 100 percent privately-funded.

The aggregate result of all of these realities is that at UCLA as well as throughout the country, maintenance of the infrastructure for research has been too long deferred, and facilities have deteriorated seriously despite the fact that last year at UCLA, we ranked number one among all U.S. public institutions in private fund raising.

It should also be noted that we have had to pay a high Price for whatever maintenance we have undertaken. Construction and renovation for largely Federally-supported and sponsored research has diverted scarce and previous discretionary funds, derived from gifts and endowment, from other urgent academic purposes, particularly attracting new and top-line students.

Finally, it should be noted that these annual maintenance needs—UCLA's of $7 million, the national medical schools' of between $241 and $400 million—would simply maintain the status quo—the present capacity—in reasonably modern shape and with state-of-the-art equipment. But the investment would do nothing to relieve present overcrowding. Moreover, we live in a growing Nation. The pool of (AK) men and women seeking entrance into undergraduate, graduate and professional schools will hopefully resume its upward march—as you know, it has leveled off or declined in recent years.

In a progressively more technological society, more (AK) people will have to extend the number of years they spend in school, and more will have to acquire graduate and professional degrees. Thus maintaining the status quo will not be sufficient to meet these needs for our Nation.

Moreover, as the Nation's higher education plan expands, a persuasive logic can be advanced to enlarge the country's research capacity. Equally persuasive will be the argument that the Federal Government participate in this growth.

Members of the committee, the national medical schools and teaching hospitals, the institutions in which most of America's biomedical research is conducted, face a severe infrastructure problem. While my remarks have highlighted the problems of the research-intensive schools, these problems differ only in degree among medical schools.

We have struggled since 1968 to maintain our existing plan and to add to it, but slowly and inexorably, we are losing this battle. If American science is to retain world leadership—and make no mistake, we are beginning to slip in some areas—and if the opportunities unveiled by the spectacular scientific advances made possible by earlier investments are to be exploited for human benefit, Federal help to preserve the research plant is essential.

Thank you very much.

The CHAIRMAN. Thank you very much, Dr. Langer.

[Prepared statement of Dr. Langer follows:]

PREPARED STATEMENT OF DR. GLENN A. LANGER

Good Morning. I am Dr. Glenn A. Langer, Associate Dean for Research at the University of California, Los Angeles, (UCLA).

My task today is to reduce the global statistics presented by Dr. Barnes to the more human scale of a single institution. Mine, the University of California at Los Angeles (UCLA), was chartered in 1951; its first class of 26 students graduated in 1955. Its intellectual architect and founding Dean, Dr. Stafford L. Warren, himself an investigator of distinction, was determined that this school would develop a strong research program. Fortunately, the medical school became operational at about the beginning of the rapid growth phase of the extramural programs of the National Institutes of Health (NIH).

The health research facilities (HRF) program played a critical role in achieving Dr. Warren's vision. Over the lifetime of this program, nine grants, totalling about $6.5 million, were awarded to UCLA and enabled it to build its initial laboratory facilities; several awards were targeted, for example, for research in the basic sciences, in pediatrics, in chronic diseases, in neurology and psychiatry and in ophthalmology. The HRF program launched UCLA on the trajectory of becoming one of the nation's handful of research-intensive academic medical centers. Thus, for academic year 1987-1988, the Center for Health Sciences at UCLA, reported a total of $144 million in

research support of which 70% was federal in origin. This ranked either 4th or 5th in the nation and this for a schools that was started in the last half of this century! (Various UCLA-affiliated institutions received additional research revenues not included in the totals just cited.)

These figures reflect the remarkable success of individual faculty members in winning NIH research support in the fierce national competition that now prevails. It is predicted, for example, that in fiscal 1990 the NHLBI will fund less than 20% of approved applications and virtually none of this support is for facilities.

This is the "good news." Now let me address the very real problems which face us. Let me begin by looking at our research activity in the perspective of our overall missions of education, research and patient care. Research turns out to comprise 42% of the schools total budget and to occupy 322 thousand NSF of space. This means that, at $144 million total support in the past year, each square foot of research space is generating almost $400. This is an extraordinarily high ratio and points to a serious problem. There is a critical lack of space in our institution.

Maintenance of the integrity of our research program, including the facilities in which it is conducted, constitutes one of the most serious challenges and most nagging

preoccupations that face the Dean. It influences almost every one of the school's recruitment, tenure and promotion actions.

Let me make certain that everyone understands why this is so. The stability of the institution's research effort demands that our faculty continue to compete successfully for ever scarcer federal research funds. Research in our school, as in every other one, is heavily dependent on federal support. - 75% at the current time Success in the recruitment and retention of a competitive research faculty is a function of what the university can offer its members, in terms of salary and fringes but, even more importantly, in terms of the environment, both intellectual and physical, in which they will spend their productive years. Good scientific investigators need space designed for modern research technology. In my experience, sadly, most of our most creative faculty members never have enough space and personnel to perform current protocols much less develop new programs for the future. And certainly none ever have as much as they want. But if UCLA is to remain in the vanguard of biological and medical science, it must have modern research space in adequate amounts. Thus, a major task of my office is to make sure that UCLA has an inventory of research space of such size and in such condition that will allow science to be carried out efficiently and effectively, that will enable the school to recruit new and retain existing faculty members distinguished for their research accomplishments and that will permit the institution to compete

effectively each year for the most promising graduate students and post-doctoral fellows. Otherwise our research programs will flounder and the next generation's research workforce will not be trained, at least not efficiently at UCLA.

At the moment, our research facilities are seriously overcrowded and far from state-of-the-art. People are shoe-horned into laboratories like sardines. The fire marshals are continuously complaining about the hazards caused by the equipment that has been moved out into the halls so investigators can move into the laboratories. Particularly worrisome is the scarcity of vivarium space in relation to need, and the condition of such space as exists. Several medical schools with awesome research capabilities have, for lack of space, been unable to accept new research awards unless on-going projects terminate. Thankfully, UCLA has not yet reached that point but we are very close.

UCLA has presently under construction a medical research building of 80,000 NSF built at a cost of $48,000,000. This is being built entirely with private donations (no state or federal funding) obtained by an extraordinary fund raising campaign in the Los Angeles community over the past 5 years. All of the space had been assigned 4 years before we expect the building to open. Since our programmatic research funding has been increasing at a rate of 20-25% per year (despite increasing

competition), this includes no funding for space and we remain in a serious space deficit.

Science is evolving at a rapid pace. But progress continues to depend on measurement and to be constrained by the limitations of the tools of measurement. As new instruments become available and previously unmeasurable properties of systems can be assessed, new conceptual vistas open. This is the stuff of scientific advance. The flip side, however, is not only the obsolescence of older instruments but also increasing inefficiency in space utilization that shades, at variable rates, into disfunctionality and eventually obsolescence. The era of molecular genetics, for example, has engendered demand for increasingly sophisticated equipment. Many of these instruments cost $250,000 or more. Our total annual Biomedical Research Support Grant (BRSG) from the NIH, which the Dean uses to fill institutional research needs (including supplies, personnel and equipment) is $282,000 this year.

While there is field-to-field variability, my impression is that UCLA has found it desireable to modernize or renovate research space about every 15 years and that after about 50 years, most buildings have to be either replaced or gutted for complete interior reconstruction. We are coming to that time at UCLA. Thus, on the average, 1/15 of our inventory, or about 27 thousand NSF of space should be scheduled for refurbishing every

year. What does it cost to modernize? A 1980 estimate of this by the Association of American Medical Colleges (AAMC), was about $330/NSF. Applying this estimated cost to 1/15 of our research space inventory, UCLA ought to be spending over $8 million every year to keep our facilities up to standard. This is no small item in the Dean's annual budget.

Incidentally, the Committee may be interested in the AAMC's estimate of the aggregate amount that medical schools should spend to maintain their research facilities in up-to-date condition. The Association assumed that in 1985, there were over 18 million NSF of space used for the pursuit of NIH supported research. (The 1988 NSF Survey found 22 million NSF in medical schools, a total that included both NIH - dedicated space as well as space for research supported by other federal and non-federal sponsors). Using an average remodeling cost of $330/NSF, the AAMC projected annual national costs for the renovation of only the space dedicated to NIH-supported research in medical schools of $398 million for a 16 year renovation cycle, $301 million for a 20 year cycle and $241 million for a 25 year cycle.

Dr. Challoner noted the costs for capital improvement can be included in the overhead rate and thereby recovered, to the extent that the facility if used for federally-supported research, through indirect cost reimbursement on federal grants. The interest the school pays on money borrowed for capital

improvements can be recovered as also can a portion of the principle, through use charges or depreciation. Unfortunately the allowances for use cannot exceed 2% per annum of the value of the asset; and institutions must pay a very large penalty if they shift over, as is now permitted, to depreciating the asset. Thus the policy and practice governing indirect cost recovery currently in effect allow an institution to recoup only partially its investments in capital improvement, even under the most favorable circumstances. But circumstances are seldom favorable. The traditional faculty attitudes towards indirect costs throughout the U-Cal system as well as in many other schools have made it impractical for the administration to seek reimbursement for even that much. Moreover, the federal process for setting indirect cost rates has often been highly arbitrary; yet for a variety of prudential reasons, universities have been loath to challenge unfavorable rulings. So, for the most part, we have had "to eat" a substantial fraction of these costs. UCLA fortunately is part of an enlightened system of public higher education, as are many of other public medical schools. Our state government has been willing to help pay our facility modernization costs with assignment the of 6.5% increase in our indirect rate solely for capital improvement. Private medical schools, however, do not enjoy the luxury of reliance on a state tax base to assume a share of the cost of federal research programs. But in all cases, state government funding is woefully inadequate and both public and private schools have had to

scramble for funds from a multitude of sources---gifts, endowment, discretionary funds, practice plan contributions---to complete construction projects. (Witness our new research building---100% privately funded.) Private donors are more likely to proffer support for new construction, where contributions enable them to memorialize their generosity. The aggregate result of all of these realities is that at UCLA, as well as throughout the country, maintenance of the infrastructure for research has been too long deferred and facilities have deteriorated seriously despite the fact that last year UCLA ranked #1 among all U.S. public institutions in private funding.

It should also be noted that we have had to pay a high price for whatever maintenance we have undertaken. Construction and renovation for (largely) federally-sponsored research has diverted scarce and precious discretionary funds, derived from gifts and endowment, from other urgent academic purposes.

Finally, it should be noted that these annual maintenance needs---UCLA's of $8 million, the national medical school's of $241 million to $398 million---would simply maintain the status quo---the present capacity, in reasonably modern shape and with state-of-the-art equipment. But the investment would do nothing to relieve present overcrowding. Moreover, we live in a growing nation. The pool of young men and women seeking entrance into undergraduate, graduate and professional schools will resume its

upward march in the next decade. As a consequence, it is necessary for existing institutions to begin to expand now and for some new ones to come on line soon. In a progressively more technological society, more young people will have to extend the number of years they spend in school, and more will have to acquire graduate and professional degrees. Thus, maintaining the status quo will not be sufficient to met the educational needs of our nation. Moreover, as the nation's higher education plant expands, a persuasive logic can be advanced to enlarge the country's research capacity. Equally persuasive will be the argument that the federal government participate in this growth.

Members of the Committee, the nation's medical schools and teaching hospitals, the institutions in which most of American's biomedical research is conducted, face a severe infrastructure problem. While my remarks have highlighted the problems of the research-intensive schools, these problems differ only in degree among medical schools. The majority have research programs of significance: 70 schools, or 55% of the institutions, received in excess of $10 million in NIH awards in FY 1987 and 89 schools, 70% of the total, were awarded more than $5 million. Moreover, all award Ph.D. degrees and train postdoctoral M.D.'s in research. We have all struggled since 1968 to maintain our existing plant and to add to it. But, slowly and inexorably, we are losing this battle. If American science is to retain world leadership, and if the opportunities unveiled by the spectacular scientific advances made possible by earlier investments are to be exploited for human benefit, federal help to preserve the research plant is essential.

Thank you.

The CHAIRMAN. Dr. Satcher?

Dr. SATCHER. Thank you, Mr. Chairman.

I, too, appreciate this opportunity to appear before the Senate Committee on Labor and Human Resources on behalf of the Association of Minority Health Professions Schools, and I too will summarize from my report.

I would just remind you that the Association of Minority Health Professions Schools includes all of the historically-black medical, dental, pharmacy and veterinarian schools except for those at Howard University, and we have had several opportunities to testify before you, and we appreciate that.

The Association, of course, has concern for the role of minorities in health care and health professional education and biomedical sciences research, and it is primarily from this perspective that I testify today.

I think that we have two critical national problems as relates to biomedical research. One, of course, is the state of disrepair of our biomedical research facilities. And I had the opportunity to serve on the NIGH committee last year to develop policies for biomedical research facilities, and I share the testimony which you have heard to this point in time about the critical nature of that problem.

I think the other critical problem relates to human resources, and one aspect of that problem is the plight of minorities relative to the work force, relative to health status and research support. Several studies, including the recent study from the American Council on Education entitled, "One-Third of a Nation", have served to highlight the fact that by the year 2000, more than one-third of the people entering the work force in this country will be minorities.

At the same time, we have witnessed in this country a continuing problem in terms of the health status of blacks and other minorities. In 1985, then Secretary Margaret Heckler presented a report to Congress on the health status of blacks and other minorities. I think that report served to point out the serious gaps that exist. But the unfortunate thing is that recently, the National Center for Health Statistics pointed out that at least for blacks in this country, life expectancy has in fact decreased since 1985, and that is a major concern to us and, I think, to the Nation.

The interesting thing is that also since 1985, the percentage of NIGH research funds going to minority institutions and minority-related research has also declined, and last year, July 1988, I was able to present to the Director's Advisory Council of NIGH and to point out that this had taken place and to request that NIGH set a goal for significantly increasing that support.

I think the problem is that we are witnessing a decline in the involvement of minorities in the biomedical sciences. In the last ten years, there has been a definite decline, and that decline threatens to continue unless we take efforts to turn it around.

In terms of what must be done, we feel that it is important that support for research at minority institutions and other institutions of emerging excellence be given priority. We support merit review of research proposals, but we feel it is important that the guidelines and criteria include the significance of institutions that have targeted these national problems and concerns that relate to the

health status of minorities and the role of minorities in biomedical research.

So we support the criteria that were submitted by the special committee, including in looking at institutions of emerging excellence that we consider institutions that have a plan for research or training enhancement for minorities and have demonstrated the ability to carry it out; second, that these institutions have already demonstrated a commitment to enhancing or expanding their research productivity, such as involvement in research centers at minority institutions recently funded by NIGH; third and very important, that research and research training programs that have a special relevance to a problem, concern or unmet need of the country, such as the health status disparity for blacks and other minorities or the under representation of minorities in biomedical research, and finally, institutions that have been productive in research or research development and training in settings where significant barriers to institutional development have been created either by the under representation of minorities, the health status of a large segment of the population, or a regional deficit in health care technology, services, or research resources.

I think there are two messages which can be sent to the Nation as we target these problems and resolutions. First, I think that if in fact we give priority to funding institutions of emerging excellence, it will enhance the role which these institutions have played throughout their histories and facilitate their impact upon this problem.

Second, I think it will send a very positive message about the value which we as a Nation place upon this mission. And not only will these institutions work to eradicate this problem of the under representation and the health status of minorities, but more and more other institutions will also become involved in a very productive way.

So with that in mind, we strongly support the legislation at hand, and we appreciate the attention which your committee has given it.

[Prepared statement of Dr. Satcher follows:]

PREPARED STATEMENT OF DR. DAVID SATCHER

Mr Chairman, I am very pleased to appear before your committee to discuss the issue of Biomedical Research Facility Construction. The Association of Minority Health Professions Schools is comprised of all of the historically black medical, dental, pharmacy, and veterinary medical schools in the country with the exception of those at Howard University. Our institutions have a historic commitment to train minority professionals to serve underserved populations by practicing in medically underserved areas or by targeting, through biomedical research and clinical means, disorders that disproportionately affect blacks and other minorities.

There are many in the country who consider these institutions a national resource. Combined, these eight institutions have trained approximately 50% of all of the black physicians in the country, 40% of the black dentists, 25% of the nation's black pharmacists, and 75% of the nation's black veterinarians. Because of the unique status of these institutions and the historically disproportionate contribution these schools have made, we believe very strongly that a definite and specific federal commitment should exist to support the building of the overall research infrastructure and capabilities of these schools.

A number of key advisory bodies have recognized the seriously compromised condition of all of this nation's biomedical research facilities. Last year the National Academy of Sciences and the National Institutes of Health convened a group of experts to develop policy recommendations for facility construction. And this year, the NIH convened experts from the nation's research and academic fields to prepare a report for the House Appropriations Committee on the issue of health research facilities. A consensus theme during the discussions was that there is a crisis situation developing throughout academic health centers in the United States that needs to be addressed in the very near future. As a nation, we stand to miss out on significant research opportunities and challenges if we do not focus a greater emphasis on federal capital contributions for maintenance and construction of research facilities to house the important scientific investigation that is taking place, or needs to take place to improve the health of all Americans. State-of-the-art research cannot be performed in archaic facilities.

The problem of facilities for minority health professional schools is not unlike many of the other challenges we face in our year-to-year operation. The collective mission of our institutions to train disadvantaged and minority individuals to serve in underserved areas is not conducive to institutional

financial stability. Because of that mission our institutions fall behind in the entire realm of research infrastructure--from our research faculty, to instrumentation, to facilities. For example, less than 1% of the NIH budget in 1988 went to minority institutions and minority related research. But Congress and the NIH have begun to recognize the importance of developing adequate research infrastructure at minority schools by implementing the Research Centers at Minority Institutions program, designed to support some of these aspects. However, support for facility construction is needed in order to address the overall issue of infrastructure development and improvement. Institutions of Emerging Excellence in research that have a special mission and concern for the under-representation of minorities in health sciences research and health status of blacks and other minorities should receive appropriate consideration and support in extramural biomedical research facilities construction. We view the under-representation of blacks and other minorities in health sciences research as a national problem of major concern.

The Association of Minority Health Professions Schools recognizes the importance of a federal facility construction system that utilizes peer review based on institutional capabilities, track record, and scientific merit. We do also recognize and urge that some federal resources be awarded to institutions based on the health status needs of our nation, and the needs and capabilities of the institutions that can have the

greatest impact on addressing those needs. The historically black health professions schools in the nation, despite inadequate support in the past, are developing an emerging excellence and capability to train faculty and study diseases that disproportionately affect minorities. We believe that when considering Federal facility renovation and construction resources, criteria should be developed that recognize these important unique capabilities.

Mr. Chairman, the Association of Minority Health Professions Schools supported provisions in the Senate NIH reauthorization bill last year that established specific criteria for Institutions of Emerging Excellence to receive facility construction resources. We also agree with last year's Committee Report #100-363, which states that institutions which have already begun developing needed infrastructure and productive research projects with the assistance of programs like Research Centers at Minority Institutions have demonstrated the kind of potential and achievement to be considered Institutions of Emerging Excellence.

The Association of Minority Health Professions Schools would like to recommend criteria similar to that which was in last year's NIH bill. Institutions of Emerging Excellence:

(1) Would have a plan for research or training advancement and the ability to carry it out;

(2) Would carry out research and research training programs that have a special relevance to a problem, concern, or unmet need of the United States, such as the health status disparities of blacks and other minorities;

(3) Have already demonstrated a commitment to enhancing and expanding their research productivity, such as participation in the Research Centers at Minority Institutions program;

(4) Have been productive in research or research development and training in settings where significant barriers to institutional development have been created by a) the under-representation of minorities in health science careers; b) the health status of a large segment of the population; c) a regional deficit in health care technology, services, or research resources that can adversely affect health status in the future.

Several recent reports have highlighted the fact that by the year 2000, over 1/3 of persons entering the workforce will be minorities, therefore any major national program geared toward upgrading research and research training must be certain to upgrade the role of minorities and the institutions whose mission have been most relevant to this national concern.

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Mr. Chairman, thank you for the opportunity to present the views of the Association of Minority Health Professions Schools. We look forward to working with you to enact these important policies . I would be pleased to respond to any questions you have.

The CHAIRMAN. Thank you very much, Dr. Satcher, for the very important and valuable comment that you have made. Going back to 1976 and 1978, we tried to get some set-asides in terms of the National Science Foundation for women in science and minorities in science professions. We looked at the flow line, for example, in science research at that time, to ensure that we would try and develop programming that would enhance and encourage in the basic sciences. There have been some efforts there over the period of time, but clearly, I think that the points that you mention are dramatic testimony to where we are today, and you would not find any argument with me about the reasons for that, which we won't take the time of this committee hearing to go into.

But this is an important point. We are talking about enhancing in terms of the existing research facilities where there is critical need; hopefully we will be able to start to build a national consensus and will be able to expand that kind of support. That is obviously my aim. But in the meantime, how are we going to ensure that these other areas which have not been a part of that whole process in the system in the past and yet are dealing with some of the very important areas of health sciences, a wide variety of other issues are going to be a part of it.

I would be interested in how Dr. Wilson and Dr. Langer would respond to shaping that particular mechanism so that we will be able to address what our particular needs are—whether, first of all, they see this as being a need, and second, how they suggest we try and deal with it.

Dr. WILSON. I welcome the opportunity to speak to that. I believe we need to think of our whole apparatus as a system with many components in terms of the types of institutions and Fields, stages of development, but also an array of different mechanisms for supporting facilities.

Some of the mechanisms that we have are better designed for developing new capacity than others, and some are better aimed at sustaining the capacity that we have already developed through prior investments.

The Grant mechanism in your bill here is particularly well-designed for dealing both with developing new entrants to the field, including existing minority institutions or institutions which will provide a hospitable climate for women and minorities to join this career track as it is also a good mechanism for addressing some of the renovation and new construction needs. The Grant mechanism, especially the leveraging that is involved with private support, is a very good mechanism for dealing with both facets.

Other mechanisms, like the indirect cost reimbursement mechanism, do not work well for the minority biomedical institutions because they do not have a sustained flow already; they are still building that, so that one is a mechanism that works better for the existing ones. But I think to be responsible, we need to have the full array, and we need to make sure that the women and minorities are being attracted in here. So I certainly endorse what my colleague David Satcher has said.

The CHAIRMAN. Dr. Langer?

Dr. LANGER. I would certainly agree that there are a large spectrum of institutions across the country—some at different stages. I

think as long as our guideline is excellence, and that is the key word here, in supporting, I think we are fine. I think we have to keep in mind that excellent research today is largely a team effort, and that team can be two or three people, or it can be a very much larger team, but there has to be a nidus within any institution, and not every institution can be all things to all men, by any means. But I think one of the guidelines we should keep in mind along with the excellence is that there is either in place or plans for development of a core or nidus or focus in a particular research area. I think this is critically important. I think the age of the person, man or woman, by him or herself, producing something most efficiently in the research area all by himself, isolated from others, is over. I think we have to look at our institutions in terms of having these foci, even though they may consist of only two or three people.

The CHAIRMAN. Dr. Satcher, we heard earlier in the course of reviewing the history of Federal support how, back even in the Seventies, $400 million leveraged $600 million. Clearly, that kind of leveraging is not possible for the institutions that you are talking about. I don't know what avenues of funding other than the Federal support the minority institutions have explored.

Dr. SATCHER. Well, I am beginning my eighth year as President of Harry. My first 5 years there, we had a national fund raising campaign entitled, "A Plan for Academic Renewal". It was a $33 million campaign—$20 million to recruit faculty, and it had a lot to do with trying to develop a core of people who could begin to impact upon research needs—$4 million for facilities renovation know now that it should be been much more because we have gotten a better handle on that—$4 million for upgrading our libraries, and $5 million for scholarships.

We raised $37 million during those five years, and we were able to significantly enhance our faculty. We have quadrupled research funding at Harry in the last 6 years now. So I think that growth is on the way—and I am talking about Harry because I know most about it; I could talk about Rehouse, where a similar thing has taken place. So we are not just looking to the Federal Government. That funding was all from private foundations, alumni and others, and we have even had some alumni to endow our research funds, and that is increasing.

So we need support from the Federal Government, and we feel that we have not been adequately supported because, as I said, less than one percent of NIGH funds go to all historically-black colleges and universities in the country, and I think that needs to be dealt with. But I think we also have to look for other means, and we are.

The CHAIRMAN. Well, that is helpful, and when we have the new nominee for the NIGH, we will inquire of the new nominee about this particular issue, and we look forward to working with you.

This is a tough needle to thread, as all of us know around here, and to try and deal with these issues, and if you look through the hearings that we have had, I think there is a remarkable sense of community across-the-board which in my own sense perhaps did not exist as much before—maybe it did, and I was not as conscious of it. But I really feel that there is a remarkable sense of community and awareness of these matters, and we want to try and fashion

and shape a mechanism which is going to deal with these questions and do it in a responsible and sensible way. So we are going to need a good deal of help and attention.

Let me ask Drs. Wilson and Langer, when you talk about these crowded conditions at UCLA and the University of Michigan, have you lost researchers because of space—and where do they go?

Dr. LANGER. Oh, yes.

Dr. WILSON. Yes.

Dr. LANGER. Well, it is very difficult. Some will go into the industrial areas; some will go into the parascientific areas. Some will go back into areas solely of teaching, and that's fine, we don't lose them entirely, but we do lose their research expertise. And I will state, Senator, that in addition to losing these people, we are literally in a position know in my own laboratory we have been waiting for five years to be able to recruit in a developing area, and we have been waiting simply because we don't have the space to put these people.

Dr. WILSON. We have had a similar kind of experience, and I think one of the most critical things that we face is the difficulty in attracting a department chairman, where we need to bring in new blood for leadership and vision of a unit but in order to do that, really need to provide space for not only the chairman but for some (AK) people so that the individual can build a department, and that is exceedingly difficult in our present straits.

The CHAIRMAN. OK. I want to thank you all very much. It has been a very helpful hearing. We are going to be moving this legislation. I think we have had strong bipartisan support in terms of the recommendations. We are basically trying to take the best of various recommendations and suggestions, and we are constantly open to those and wish to do it in a way which is going to be both realistic and can gather the widest breadth of support. So we will be moving along with the legislation, and the record that you have helped to make here today will be extremely helpful to us.

Thank you very much. The committee stands in recess.

[Whereupon, at 4:33 p.m., the committee was adjourned.]

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